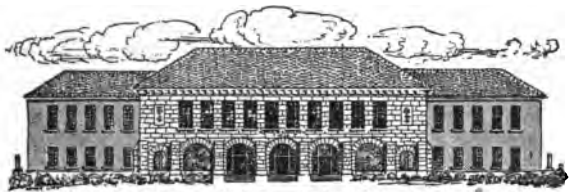
DIES IN THE PRINCIPLES OF GEOGRAPHY

EARL E. LACKEY



STUDIES IN THE PRINCIPLES OF GEOGRAPHY

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FOLLOWING THE PROJECT-PROBLEM METHOD

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THE PREFACE

This little book represents an attempt to develop a working knowledge of some of the principles of geography through the problem method of attack. It is the outgrowth of classroom experience and has been in the process of evolution through a number of years. The method of attack and development follows as nearly as possible the natural steps in the thinking process.

The aim has been not to sacrifice pedagogical considerations for the sake of a logical arrangement, but to correlate the two in the best possible way. It will be noted that there are ten groups of problems. Each group is introduced by the statement of the large idea, the central thought running through the entire series of problems. The main problems of this book involve what may be considered a list of basic minimum essentials in the principles of geography. The conclusions, which are an essential part of each problem, require the formal statement of a large list of geographic principles, each vitally connected up with some problem full of life interest. The related problems are calculated to give the student drill on principles previously learned, and to afford opportunity to recognize old principles in new associations. Frequently it will be found that the related problem is really a corollary to the main problem, rather than a mere practice exercise.

It may not be out of place here to state that this syllabus was awarded first place by the National Council of Normal School Presidents and Principals in a competition among syllabi submitted from thirty-seven normal schools in twenty-four states. The consistent and studied use of

the problem method was one of the reasons given for the selection of this syllabus to head the list. In order to get the author's point of view, the teachers who use this little book should read thoughtfully the suggestions to teachers offered under the title "The Problem Method of Attack in Geography," page 109.

The author has used this syllabus with excellent results in teaching the principles of geography to students with varying degrees of academic preparation. Pupils in the upper years of the junior high school and students in the rural and advanced courses of the normal school, all have followed the work eagerly and with much profit. It is recommended as an excellent line of work for students in the normal training courses of our high schools.

It is fitting and proper that the author should acknowledge his indebtedness to President U. S. Conn of the State Normal School at Wayne, Nebraska, for his sympathy and kindly encouragement in this work, and to Dean H. H. Hahn, director of the Training School at the same institution, for his help and valuable advice relative to the organization of geographic materials for presentation in problem form.

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I. INTRODUCTORY

PROJECT[1]

This project is designed to develop three significant ideas: first, the importance of a meaningful definition of geography; second, the essential and relative values of facts and principles as applied to geographic work; and third, the great need for specific aims in modern geography teaching.

1. THE DEFINITION OF GEOGRAPHY

Purpose (the teacher's aim for a sub-unit of the project)[2]: To compare a number of definitions of geography and to determine which of them is best suited to our needs at the present time

Problem (the pupil's contact with a sub-unit of the project)[3]: How does the geography of today differ from the geography of a few years ago, and how will your

[1] A project is a complex unit of work carried to completion in its natural setting under the inspiration of purposeful activity on the part of the pupils. In order to work out a project it is usually necessary to break it up into several parts or sub-units of work. These sub-units of work are termed **problems.**

[2] The teacher necessarily is interested in the project as a whole, and when thinking of the parts of the project he must be interested in each part as related to the whole. The teacher's aim for one of these sub-units of activity is a problem-project, so called because the teacher views this sub-unit of work as a problem connected with a project. When we speak of a problem-project, we are thinking of the situation from the teacher's point of view. In this outline the problem-project is designated as the **purpose.**

[3] The pupil comes into daily contact with the project through the problem. He is not so much concerned about the project as a whole. His large interest is in the sub-unit of daily work. This sub-unit is introduced to the pupil through the problem. Since the problem in this book is a part of a project, it may very properly be called a project-problem. When we speak of a project-problem, we are looking at the situation from the pupils point of view. In this book the project-problem is designated simply as the **problem.**

definition of the subject influence your attitude when you are studying and teaching it?

Studying the Problem (gathering, organizing, and testing facts):

1. Recall definitions of geography that you know, find several from old and also from more recent texts, write them down, note the author, and bring them to class for comparison and discussion.
2. Study the following definition: Geography is a study of facts concerning the earth and its products, of facts concerning man and his industries, and the principles dealing with their physical and social interpretation.
3. What new element do you discover in the definition just stated? What shifting of emphasis is noticeable? Discuss the points in which it is inferior or superior to other definitions you have considered.
4. How may a definition of geography benefit one who expects to teach it? Would you teach your definition to the children?

References (helps in studying the problem):

Dodge and Kirchwey, *The Teaching of Geography*, pp. 1–5; Holtz, *Principles and Methods of Teaching Geography*, pp. 1–5; Lyde, *The Teaching of Geography;* Archer-Lewis-Chapman, *The Teaching of Geography;* Sutherland, *The Teaching of Geography; Educational Review*, XLIX, 236; *Journal of Geography*, XIII, 83, 201; XIV, 295; XVIII, 185

Conclusions (a summary of important facts and principles):

1. Essential element in the geography of today
2. Three definitions representing, respectively, the old, the recent, and the new in geography
3. Value of geography in the course of study
4. The changing emphasis in geography
5. The value of a definition in geography

Related Problems (applying and fixing important facts and principles):

1. Find out the names of several kinds of geography

and the nature of the materials with which each deals.

2. What is the difference between good and poor geographic materials?
3. Wherein do definitions generally fall short of pointing definitely the way to the teacher?
4. What are the three things you consider the most vital to the best interests of geography work at the present time?
5. Wherein is geography, as now taught, generally falling short of securing the results it ought to accomplish?
6. What is meant by "humanized geography"?
7. How is geography related to other subjects in the curriculum?

2. GEOGRAPHIC FACTS AND PRINCIPLES AND THEIR CLASSIFICATION

Purpose: To study the relations existing between geographic facts and geographic principles, and to determine the place of each in the study of geography

Problem (to develop general principles): What are geographic facts and principles, and what use can be made of them?

Studying the Problem (gathering, organizing, and testing data):

1. Read what different authors have to say about the nature of geographic principles and their importance. Write down some of the most valuable statements you find and bring them to class for discussion.
2. Study the following definitions and be able to comment on their value:
   Principles of arithmetic are the laws of arithmetical interpretation, the rules for solving the arithmetical problems in our environment.

Principles of geography are the laws of geographic interpretation, the rules for solving the problems in our geographic environment.

Geographic principles are the laws which interpret the relationships existing among geographic facts.

3. What effect does the emphasis of geographic principles have on the scope and value of geography?

   How are geographic principles related to the new geography?

4. Farm animals are divided into five classes; namely, horses, cattle, sheep, swine, and poultry. Each class is divided into types and breeds. For example, there are four types of horses—the draft, the coach, the road horse, and the pony. Each type is divided into a number of breeds; for example, draft horses are divided into Percherons, Clydesdales, Shires, Belgians, etc.

   See if you can devise a scheme whereby geographic principles could be classified in some such comprehensive way.

   What good purposes might be served by such a classification?

References (helps in the study of the problem):

Dodge and Kirchwey, p. 61; Holtz, pp. 256–258; Sutherland, pp. 27–36; Hotchkiss, *Representative Cities of the United States*, p. 303; Archer-Lewis-Chapman, pp. 12–16; Sutherland and Sanford, *Practical Exercises in Geography*, pp. 1–17; *Journal of Geography*, XII, 161; XIV, 65, 83, 129, 201

Conclusions (a summary of important facts and principles involved):

1. Value of geographic facts
2. Definition and value of geographic principles
3. Relation of geographic principles to the subject of geography
4. Rational scheme for the classification of geographic principles

5. How geographic facts and geographic principles are vitally related

Related Problems (applying and fixing important facts and principles):

1. Give some principles underlying the location of cities. (See Hotchkiss.)
2. What principles or rules are learned by means of which problems in percentage are solved? What is the purpose of the list of problems or exercises following the development of rules or principles? What is the value of the rules and principles in arithmetic? Discuss the possibility of organizing and developing the principles of geography in a similar manner, and applying these principles to a set of concrete problems.
3. Name some of the principles underlying the development of manufacturing in New England. (See Sutherland and Sanford.)
4. What expressions in definitions of geography that you have studied state or imply the value of geographic principles?
5. Why have the laws of mathematical, linguistic, and scientific interpretation been more carefully worked out and formulated than the laws of geography?

3. THE AIMS OF MODERN GEOGRAPHY

Purpose: To discover how the new needs in education have changed the emphasis in geography work

Problem: What are the aims of modern geography, and what conditions have made a restatement of them necessary?

Studying the Problem:

1. What is the goal of education in a democracy? (See *Bureau of Education Bulletin*, 1918, No. 35.) How may

education socialize the individual as well as intellectualize and industrialize him? What can geography do to assist in realizing the new goals in education?

2. Study and carefully analyze the following aims for modern geography:
   a) Geography should seek to create in the children an abiding interest in how the peoples of different countries live — their important industries, their fine achievements, their pleasures, their leisure-time activities — and the reciprocal duties and responsibilities that exist between them and us.
   b) It should give pupils a mastery of geographic facts and principles so that they will be able to explain the development of important industries, the location and growth of leading cities, and the interdependence of the peoples in different parts of the world.
   c) It should give such a thorough training in the use of the tools of the subject — namely, maps, texts, reference books, government bulletins, etc. — that the pupils may become independent workers in the solution of geographic problems.
   d) It should determine for the pupils whether or not a people are using wisely the resources nature has given them, how they may improve their opportunities, and what we may do to assist them.
   e) It should produce a social orientation in the lives of the pupils such as will lead to a sympathetic study and understanding of peoples and races other than their own.
3. Recall the definitions studied in the first problem and see if they are sufficiently broad and yet definite enough to include the aims as just stated.
4. What place in socializing the individual does geography occupy that no other subject can fill?

References:

Dodge and Kirchwey, pp. 1–15; Holtz, pp. 1–5; Sutherland, pp. 80–95; *School Science and Mathematics*, February,

1920, pp. 117 and 157; ***Bureau of Education Bulletin***, 1918, No. 35; ***Educational Review***, March, 1920, p. 236; books on education; ***Journal of Geography***, March, 1920, p. 89; February, 1920, p. 61; May, 1919, pp. 177, 185; January, 1919, p. 24; November, 1918, p. 111; February, 1917, p. 192; November, 1915, p. 65; April, 1916, p. 295

Conclusions:

1. Goal in modern education
2. Need for socialized education
3. Need for creating an abiding interest in geography
4. Why a working knowledge of geographic facts and principles is so important
5. Nature and use of geographic tools
6. Value of knowing the natural resources possessed by different regions and peoples
7. How geography may help in producing needed social orientation
8. How physical and social orientation are related

Related Problems:

1. What are some of the valuable ideals that have recently been recognized by society, and how can geography assist in making these new acquisitions permanent?
2. In what sense may it be said that the world is becoming smaller every day?
3. How can geography assist in laying a foundation for better inter-class, inter-race, and international relations?
4. What phases of the life of the Mexican people are involved in the first aim of geography as stated above?
5. What obstacles stand in the way of education for inter-class, inter-race, and international friendship and coöperation?

II. THE EARTH AS A WHOLE

PROJECT

This project seeks to develop and fix some of the principles which show the relationships that exist between the earth as a whole—including composition, form, size, motions, measurements, and mapping—and the life forms dwelling on its surface.

1. COMPOSITION

Purpose: To develop some of the relationships of the materials of which the earth is made to the life forms dependent upon it

Problem (primarily for developing principles): What are the materials of which the earth is made, how are they arranged, and how do they interact with the life forms dwelling on the surface?

Studying the Problem (gathering, organizing, and testing data):

1. What names are applied to the gaseous, liquid, and solid portions of the earth's surface? Name a number of different kinds of rock found in your vicinity.
2. Find out how plants and animals are dependent upon and adapted to the spheres of influence in which they live. Name some plants, animals, and people that are peculiarly fitted to the environment in which they live.
3. Try to find out why the air is above the land and water, and why the water is between the other two. Are the three spheres of influences strictly separate?
4. Give a few notable examples in which man has been able to surmount some of the physical barriers in his environment.

References (helps in the study of the problem):
Dryer, *High School Geography*, pp. 226–228, 243–250; Salisbury, *Physiography*, p. 3; Sutherland, pp. 27–31; Arey-Bryant-Clendenin-Morey, *Physiography*, p. 219; Mill, *International Geography*, p. 36

Conclusions (a summary of important facts and principles learned):

1. Names of the three spheres of influence in the earth's composition
2. The use of each sphere to plants and animals
3. Cause of the present arrangement of the parts
4. Apparent and real relation of the parts
5. Adaptations of plants and animals to the spheres of influence in which they live
6. Advantage to life forms of a distinct separation of the spheres of influence
7. How man may surmount obstacles in his physical environment

Related Problems (applying and fixing important facts and principles):

1. Why do not fish in the water or worms in the soil die for want of air?
2. What is the chief difference between animals and man? Between animals and plants?
3. How does the distribution of soils and rocks influence the building industry?
4. What is the origin of soil? Explain how different rock formations make different qualities of soil.
5. If the earth has been formed by the cooling, liquefying, and solidification of gases, where would most of the heaviest minerals be found, near the surface or near the center of the earth? Why?
6. Study and carefully differentiate between the nebular and planetesimal theories of the earth's origin.

7. Why doesn't the earth leave the sun? Why does it not fall into the sun? What influence would a slower or faster rate of movement in its orbit have on the earth's distance from the sun?
8. Cite instances of color adaptation of animals or plants to environment.

2. EARTH FORM

Purpose: Studying the evolution of knowledge concerning the earth's shape, and to show how a spherical earth has valuable relationships that other forms would not possess

Problem (to acquire facts and develop principles): What did peoples of ancient times think concerning the shape of the earth, what led people later to think differently, and how are we benefited by the earth's being spherical?

Studying the Problem:

1. Find out what the Greeks, Jews, Toscanelli, Eratosthenes, Prince Henry, and Columbus thought concerning the shape of the earth. What led Columbus to seek a western route to India? How long ago was it thought that the earth was spherical, and what proof was offered?
2. Find out the significance as to the shape of the earth of (*a*) eclipse of the moon, (*b*) disappearance of a ship going out to sea, (*c*) the rising of the north star as one goes northward, (*d*) the comparative weight of objects at different places on the surface of the earth, and (*e*) any other evidence you may be able to find.
3. If the earth were cylindrical, egg-shaped, or flat, what relationship to plants, animals, and man would change from the present conditions with the spherical form?

References:

Holtz, chap. xxii; Mill, pp. 8–10; Dodge and Kirchwey,

p. 11; Arey, pp. 5–6; Salisbury-Barrows-Tower, *Elements of Geography*, pp. 10–12, 22–23; Salisbury, pp. 482–484

Conclusions (summary of important facts and principles):

1. Forces molding the earth into its present form
2. How eclipse of moon proves sphericity of the earth
3. Significance of appearance and disappearance of ships moving on the sea
4. Why north star rises as one travels northward
5. Weight of equal masses at different places on the earth and its significance
6. Advantages of a spherical earth over some other possible forms
7. Why some one did not act on the principle that the "earth is spherical" long before the time of Columbus. What principle of human thought and action is involved?

Related Problems (applying the principles learned above):

1. How find the circumference, diameter, and area of the earth?
2. How long would it take to go around the earth traveling five hundred miles per day?
3. Compare the circumference of the equator with that of the forty-fifth parallel.
4. Account for the jogs in the county lines as one travels north or south.
5. What principle enables a merchant to know that when he has bought five hundred thousand pounds of coffee in Brazil, he will have five hundred thousand pounds when he gets it to New York or Liverpool?
6. Why can a pendulum clock made for use at Chicago be used anywhere else with but slight adjustments?
7. If the earth were lemon-shaped, with the axis through the major diameter, what difference in the density of the air at the equator and the poles would result?

3. MOTIONS OF THE EARTH: ROTATION

Purpose: Learning how it may be shown that the earth rotates

Problem: What is the cause of day and night, and how can you prove that your answer is correct?

Studying the Problem:

1. What did the ancients think was the cause of day and night? Was their explanation a good one? Was it reasonable? Does the fact that we have day and night prove that the earth rotates? Why?
2. Consider the following and determine their bearing on the problem: (1) Focault's pendulum experiment; (2) path of a heavy object dropped from a high tower; (3) spheroidal shape of the earth; (4) and any other significant facts or data which you find.

References:

Dryer, pp. 10, 15, 33; Salisbury, pp. 484–488; Arey, pp. 7–9; Mill, pp. 56, 68, 72, 76, 78

Conclusions

1. Relation of rotation to day and night
2. Relation of rotation to rising and setting of the sun
3. Relation of rotation to difference in time
4. Rotation and centrifugal force at equator and poles
5. Relation between rotation and habits of life
6. Comparative rate of eastward movement of a point on the surface of the earth and any point directly beneath or above it

Related Problems:

1. How fast would one have to travel on the equator to keep the sun constantly overhead, and in what direction? Why is this true?
2. What is the significance of the fact that the sun rises earlier in New York than at Chicago?

3. How does the time of sunrise or sunset compare at different places on the 90th meridian? Explain in full.
4. Suppose I have a cannon on the 40th parallel that will shoot a ball, at a uniform speed, 70 miles in one minute. If I take direct aim at an object 70 miles due north, shall I hit it or not? Explain in full. (See Johnson, *Mathematical Geography*, p. 58.)
5. How does rotation make twilight longer here than at the equator?
6. Why does a river flowing toward the equator dig harder into the west than into the east bank?
7. It has been said that the Mississippi River flows uphill. Can you find or think of any justification for this statement?

4. DAYLIGHT AND DARKNESS

Purpose: Teaching the relations of daylight and darkness to life forms on the earth

Problem: What are the advantages of having an instalment of daylight and darkness every twenty-four hours?

Studying the Problem:

1. The moon always has the same side toward the earth. Would this be a good relationship established between the earth and the sun? Why? State the needs of life on earth in relation to periods of light and darkness, particularly those of man.
2. Compare the length of the periods of daylight and darkness at the equator and the poles and state the bearing it has on the problem.
3. What effect would continuous sunshine or darkness have upon the growth and development of plants and animals?

References:

Dryer, p. 14; Salisbury-Barrows-Tower, p. 13; Robinson, *Commercial Geography*, pp. 243–244; Johnson, *Mathematical Geography*, chap. iii; Mill, p.23

Conclusions:

1. Length of day and night at (*a*) the equator; (*b*) the poles; (*c*) intermediate places between the poles and the equator
2. Advantages in the length of day and night in relation to work and rest
3. Relation of day and night to habits of recreation, play, and games
4. Effect on habits of various plants and animals in their adaptation to day or night operations

Related Problems:

1. When I go from here to Denver I have to set my watch back one hour, when I go to Boston I must set it ahead, but when I go to Galveston no change is made. Explain.
2. Compare the total amount of sunshine for a year at the poles and a point on the equator.
3. What advantage comes from having long days in summer and short days in winter?
4. How long has each day been on the earth before it reaches you?
5. It is said that twilight is much shorter in Para than at New York. Explain why.
6. What is the twilight zone?
7. Why do we change from one day to the next at midnight rather than at noon?
8. Explain how every day varies from 0 to 48 hours or more in length.
9. What would be some of the effects if the earth were to rotate twice as fast or half as fast as it does now?

10. In what direction on the earth do day and night travel? How fast?
11. Compare the length of a day on the earth with the length of a day on the moon.

5. MOTIONS OF THE EARTH: REVOLUTION

Purpose: Studying the causes of the seasons

Problem: Why do we have a marked change of seasons, while in Panama they do not?

Studying the Problem:

1. Find out the meaning of the terms orbit, axis, equator, inclination of axis, and parallelism of axis.
2. Compare and explain the difference in the heating effects of the sun's rays when shining vertically and at an angle of 45 degrees. Compare our latitude with that of Panama and show how this affects the slant of the sun's rays at the two places.
3. Why does the sun appear so much farther south in winter than in summer? Show relation of inclination and parallelism of axis to seasons. Look up the terms solstices and equinoxes and give their dates and explanation.
4. The earth is not always the same distance from the sun. Explain, and determine whether or not this fact has any influence on the seasons.

References:

Dryer, pp. 11–15; Salisbury-Barrows-Tower, pp. 6–8, 11–15; Arey, pp. 9–16; Johnson, pp. 104–132; Tarr, *Physical Geography*, pp. 15–17

Conclusions:

1. Force pulling the earth into its path around the sun
2. Size and shape of the earth's orbit
3. Relation of revolution to time divisions
4. Relation of revolution to inclination and parallelism of axis

5. Relation of slant of sun's rays to intensity of heating effects
6. Relation of distance from equator to slant of rays
7. Means by which heat gets from the sun to the earth
8. Cause of varying length of day and night on most of the earth
9. Midday altitude of the sun at different seasons and latitudes
10. Relation of revolution to location of the tropics, polar circles, and zones of temperature
11. Place of rising and setting of the sun at different seasons of the year
12. Relation of the distance to the sun at different times of the year to the amount of heat received

Related Problems:

1. Why is the warmest part of the day usually not at noon, but about two P.M.? Explain likewise why the hottest part of the summer does not come at the time of the summer solstice, and the coldest part of the winter at the time of the winter solstice.
2. If you were in Panama at noon on the following dates, in what direction would you point toward the sun: March 21, May 1, June 21, August 12, September 21, and December 21? (Study the globe.) (The teacher by use of the ruler and protractor should demonstrate this to the class.)
3. Make drawings to show the angle of sunshine for Omaha on the same dates and compare with the angles for Panama.
4. During about how long a time in the year is the angle of the sun's rays at Panama less than it is at Omaha on June 21? Draw and demonstrate this.
5. What portion of the heat given off by the sun is intercepted by the earth? (Think of the earth as

being 8,000 miles in diameter and circular in shape, and the sun as being 88,000,000 miles away.)

6. Why do the sun's rays never fall vertically farther north than 23½ degrees?
7. Why are the earth's movements not more noticeable?

6. RELATION OF SEASONS TO LIFE AND PROGRESS

Purpose: Working out the value of the seasons in their relation to man and to plant and animal production

Problem: What advantages come to life forms because of a change of seasons, that they would not otherwise obtain?

Studying the Problem:

1. Compare the length of the periods of daylight on the 30th, 45th, and 60th parallels on a June day, and explain how the results of your comparison account for the distance north that cereals may be grown. (See Mill, pp. 23–25.)
2. What of the possibility of raising corn in the corn belt of the United States if the earth's axis were not inclined? Explain. Discuss the mating season for the common wild birds and animals and show how it is related to the problem.
3. What seems to be true as to the latitudes in which are found the highest degree of civilization, and how do these facts bear on the problem?

References:

Dryer, p. 15; Mill, pp. 23–25; Semple, *The Influences of Geographic Environment*, pp. 623–626; J. R. Smith, *Commerce and Industry*, p. 67; Longmans, *New School Atlas*, p. 7; wall maps of Europe and North America; Johnson, chap. viii

Conclusions:

1. Total amount of sunshine for a year at any place on the earth

2. Comparative length of June and December days in middle and high latitudes
3. Relation between latitude and length of periods of daylight
4. Comparative length of days and nights at the equator
5. The cause of the great distance north that cereals may be grown
6. Relation between latitude and human progress
7. Relation between latitude and the amount of heat received from the sun on a given area

Related Problems:

1. Compare the length of June and December days on the forty-fifth parallel. (See almanac.)
2. Compare the total amount of sunshine received by a point on the equator with that received by the North Pole.
3. What is meant by the "midnight sun"?
4. How would the seasons here be changed if the earth's axis were inclined 45 degrees instead of 23½ degrees?
5. In what latitude does the sun have an altitude of 44 degrees at noon on the vernal equinox? Summer solstice? Winter solstice?
6. How would a slower or faster rate of movement of the earth in its orbit affect the length of seasons and consequently life forms?
7. At what time of the day and year does the sun shine in at the north windows? Why?

7. EARTH MEASUREMENTS: LONGITUDE AND LATITUDE

Purpose: Studying longitude and latitude as a means of earth measurement and the principles involved in its use

Problem: How are longitude and latitude related to human welfare?

Studying the Problem:

1. By what means is one able to locate a place in a city? In the country? Explain the system of lines by means of which one is enabled to locate a place anywhere on the earth's surface.
2. Give the etymology, origin, and meaning of the geographic terms used in the study of this topic.
3. Find out how longitude and latitude are related to (*a*) time divisions; (*b*) land survey; (*c*) travel on the seas; and (*d*) location of celestial bodies.

References:

Dryer, pp. 10–11; Salisbury-Barrows-Tower, pp. 14–18; Arey, pp. 17–29; Holtz, pp. 106–109; Mill, pp. 16–18; Dodge, *Advanced Geography*, pp. 14–15, 18–19; Tarr and McMurry, *New Geography*, pp. 201–206; Johnson, pp. 40–44

Conclusions:

1. Use of longitude and latitude as to location of places
2. Relation of longitude to time
3. Relation of longitude to land survey
4. Relation of longitude and latitude to ocean travel
5. Need and nature of standard time
6. How to determine the longitude of a place
7. Relation of time east or west to time here

Related Problems:

1. How may one determine his latitude by means of the north star?
2. Find out all you can about the invention, construction, and use of the compass.
3. What relation exists between (*a*) the inclination of the earth's axis and the location of the tropics and polar circles; (*b*) the inclination of axis and the width of the zones of heat?

4. Explain the solstices and equinoxes as to meaning and dates.
5. What is the difference in longitude of two places having nine hours' difference in time?
6. What is the difference in local time between here and Washington, D. C.?
7. What is standard time? In what time belt is your home? Is your local time faster or slower than standard time and how much?
8. Where are (*a*) places with no longitude; (*b*) no latitude; (*c*) no longitude or latitude; (*d*) greatest longitude; (*e*) greatest latitude; (*f*) greatest longitude and latitude?
9. If the earth were flat, how would our scheme of locating places operate? How about the relation of longitude and time?
10. Explain how it would be possible on any clear day at noon to determine your longitude if you had a timepiece which kept Greenwich time. Tell of a class of people who have need of just such calculations.
11. How could you determine your latitude by the sun at the time of an equinox?
12. How much earlier or later than your standard time do the time signals from Washington reach your city? From Chicago? From Denver?
13. If I start at sunrise and travel 15 degrees west today, what effect will it have on the length of my day? What if I travel east?
14. Magellan's sailors were greatly surprised to find, when they got back to Spain after sailing around the world, that their calendar registered September 6, while their home folks said that it was September 7. Explain the cause of their disagreement.

8. REPRESENTATION OF THE EARTH'S SURFACE

Purpose: Learning the construction of maps and the use and value of different forms of map projection

Problem: What is the value of mapping the earth's surface, and how is it done?

Studying the Problem:

1. If you want me to know of a friend of yours whom I have never met, how might you proceed? (Give at least three ways.)
   Likewise, if you want me to know concerning a piece of land or a region which I have never seen, how could you proceed? (Name at least three or four ways.)
2. Study the orthographic, stereographic, and globular map projections on page 19 of Dryer, or pp. 51, 52 of Arey, comparing the distance apart of parallels and meridians in different parts of the maps. In each figure compare the area and shape of the small rectangular figures near the center with those on the margin of the maps.
3. On a Mercator's map of the Western Hemisphere compare the area of Greenland with that of South America. Find the area in square miles from your textbook and explain any anomaly you find. Study also any homolographic map of the world and see if any of the difficulties of the Mercator's are found.
   Compare shape of North America in each of the above maps with North America on a globe and explain the cause of any distortions.
4. In each of the following — orthographic, stereographic, and globular projections — explain the difference between the polar and equatorial projections as to whether the meridians and parallels are straight or curved lines.

References:

Dryer, pp. 18–21; Salisbury-Barrows-Tower, pp. 24–29; Arey, pp. 50–57; Mill, pp. 20–22; Holtz, pp. 162–174, 183–204; Diercke, *Schul-Atlas*, p. 4; Johnson, pp. 190–236; Adams, *Map Projection*

Conclusions:

1. Four means of finding out about any portion of the earth's surface
2. Difficulties in the mapping of large areas
3. Disadvantages of the globe for small areas
4. Accurate and inaccurate parts of different projections
5. Principle features of each of the following maps: (*a*) orthographic, (*b*) stereographic, (*c*) globular, (*d*) Mercator's, (*e*) homolographic (See Johnson.)

Related Problems:

1. What projection is used for the maps on pages 22 and 23 of Dryer?
2. Which of the maps studied above distorts large areas most in respect to shape? Least? Which distorts most in respect to comparative sizes? Least?
3. To which of the above projections is the conic projection closely related? Bonne's projection?
4. What is the advantage of having so many different map projections?
5. What importance should be attached to the different methods of map projection?

9. SCALE, DIRECTION, AND LEGEND OF MAPS

Purpose: Developing skill in the interpretation and use of maps

Problem: How can you tell from a map the direction and distance one place is from another, and by what means may one represent different kinds of facts and data on a map?

Studying the Problem:

1. Secure two maps of the same region, one a large and the other a small one, one with and one without an indicated scale. By means of the map with the scale, work out the scale for the other. Find a map with the parallels indicated but without a scale. Figure out the scale.

On the same sheet of paper draw a map of Nebraska and one of Australia, using the same scale for each. (Scale: 1 inch = 280 miles.) First draw your network of meridians and parallels, using the conic projection.

2. On an outline map of North America draw an island 200 miles long east and west and 75 miles wide, using the same scale as that of the map and locating the center of the island in 25 degrees North Latitude and 90 degrees West Longitude.
3. Find four maps of the continent of North America, one a Mercator, one a homolographic, one a conic, and one a globular.

   On each of the maps place five dots in five different parts of the map and call them A1, A2, A3, A4, A5. One inch from A1, in the four cardinal directions, make dots, marking them N, E, W, and S. Do the same for each of the A's on this map and each of the others.
4. Find illustrations of each of the following maps: physical, rainfall, vegetation, density of population, and seasonal distribution of rainfall. Explain the means by which the information is indicated. Give other kinds of data that may be shown on a map and suggest how you could indicate them.

References:

Dryer, pp. 18–21; Salisbury-Barrows-Tower, pp. 24–29; Johnson, pp. 224–225; Mill, pp. 26–35; textbooks and commercial geographies; Adams, *Map Projection*

Conclusions:

1. Two ways of finding the scale of a map when it is not given
2. Nature of the network for drawing maps
3. Directions on the Mercator, homolographic, and globular projections
4. Means of showing different kinds of data on a map
5. The relation of directions on maps to meridians and parallels

6. Comparative shape of maps of the same region on different projections
7. Accuracy of the scale in different parts of the same map
8. Shortest distance between two points on a map

Related Problems:

1. Which way is north on a polar projection?
2. Find a map on which the top, bottom, right, and left sides are all south.
3. Find a map of North America the top of which may be east, west, or north; the right side north, east, or south; the left margin north, south, or west; and the bottom of the map east, west, or south.
4. In Diercke's *Schul-Atlas*, by means of the parallels, find the scale in miles of the maps on pages 29, 31, 62, and 68 (Guadeloupe).
5. The shortest distance from New York to San Francisco would pass to the north or south of Chicago?
6. Explain the difference in the shape of North America in Figs. 10 and 11, also 14 and 15, in Dryer.
7. Why the apparent difference in size of South America in Figs. 10 and 11, Dryer?

10. THE TOPOGRAPHIC MAP

Purpose: To learn how the government shows the lay of the land and other features of physical and human interest on the topographic map of the United States

Problem: How are the different surface and humanistic features of land area represented on the topographic map of the United States?

Studying the Problem:

1. Study a contour map that includes a portion of both land and sea within its area. What is the elevation of the shore line? What is the contour interval? The

scale of the map? The elevation of the brown line nearest the shore line? The elevation of the first accentuated brown line?

2. What is the highest point on the map? Are there any hills? How are they shown?
3. How are river valleys shown? How tell whether a valley is deep or shallow?
4. How tell whether a slope is long or steep?

References:

Salisbury-Barrows-Tower, pp. 15–18; Dryer, pp. 39, 41; topographic sheets of United States Geological Survey; Salisbury, p. 10

Conclusions:

1. Meaning of contour lines and intervals
2. Meaning of contours close together
3. How contour lines indicate valleys and hills
4. Why contour intervals are not the same for all maps
5. How the scale of miles is shown and its meaning
6. Color scheme used on topographic map of United States

Related Problems:

1. How are some of the cultural features shown on a topographic map?
2. What are some of the features in blue on a topographic map?
3. Devise a scheme whereby with plaster of Paris or Portland cement you can represent an island 2 miles long and 1½ miles wide with an extreme elevation of 275 feet. Submerge this model in water and, by taking off just one inch of water at a time, draw the contour lines. Indicate by a black line the best road to the summit of the hill, and in blue indicate a stream flowing down the most appropriate place.
4. State several values of topographic maps to the public.

III. DIVISIONS OF THE EARTH'S SURFACE: LAND AND SEA

PROJECT

This project seeks to develop the principles involved in the making of coastal features of land and water, in the movement of the waters of the sea, and in the relationship of each to the making of harbors and to ocean traffic.

11. SHORE LINES AND HARBORS

Purpose: Studying how coastal features are made and the relation of these features to the economy of labor, commerce, and travel

Problem: What coastal features result from a rising or sinking of the land, and what economic relationships result from such movements?

Studying the Problem:

1. Explain the making of bays, straits, promontories, estuaries, capes, etc. Define and illustrate each. Find out why some coasts are rougher and some more even than others.
   Explain continental islands and shelves and what they are good for. Illustrate.
2. Study the location of some important coastal cities and see if you can determine the coastal features that have contributed to their growth. Study to learn the factors that contribute to the making of good harbors.
3. What is the effect of different types of coast line on commerce and industry? Illustrate.
   How does the hinterland of a coast affect the usefulness of its harbors? Explain in full.

References:

Dryer, pp. 162–170; Salisbury-Barrows-Tower, pp. 514–534; Arey, pp. 423–433; Semple, *The Influences of Geographic Environment*, pp. 242, 287; Gregory-Keller-Bishop, *Physical and Commercial Geography*, pp. 18–33; Hotchkiss, Index; Tarr, pp. 313–331

Conclusions:

1. Cause of bays, straits, estuaries, promontories, etc.
2. Value of islands and continental shelves
3. Qualities of a good harbor
4. Relation of hinterland to harbors
5. Cause of rugged coast lines and their value
6. Cause of low-lying coast lines and their value
7. How some coasts are barriers and some invite invasion by enemies
8. Relation of irregularity to length of coastline

Related Problems:

1. Why are there so few important harbors on the western coast of North America?
2. Account for the narrow strip of deep water leading from the St. Lawrence River out through the Gulf to the ocean. (See physical map.)
3. Account for the lowlands at the head of the Gulf of California.
4. Why was Manhattan Island a good place to start a city? (See Dryer, p. 171; Hotchkiss, pp. 177–197.)
5. Why are harbors more plentiful on the north than on the south Atlantic coast of the United States?
6. Why are the North Sea and Newfoundland Banks such good fields for the fishing industry?
7. Account for Long Island, Newfoundland, and the British Isles.
8. Account for the location of San Francisco, Portland, and Seattle. (See Dryer, pp. 416–417; Hotchkiss, pp. 1–42.)

9. Study a map of Boston Harbor and determine why it is a good place for a city. (See Dryer, p. 330; Hotchkiss, pp. 161–176.)
10. Why does Europe have more coast line in proportion to its area than any other continent?

12. MOVEMENTS OF THE WATERS OF THE SEA

Purpose: Learning the nature of ocean waves, tides, and currents and their economic relationships

Problem: How account for the movement of the waters of the sea, and what is the value of this movement to mankind?

Studying the Problem:

1. Find out the cause of storm waves and what influence they have in the making of beaches, bars, spits, sea cliffs, etc. Study their relation to the making of harbors. Compare the influence of waves on shipping in the present day with that in earlier times.
   Explain breakers, whitecaps, and undertow and their value.
2. Find the cause and frequency of the tides and how the value of many harbors depends on their movement.
3. From maps of the prevailing winds and the ocean currents learn the names and study the direction of movements of currents just north and south of the equator in the Atlantic and Pacific oceans and see if you can find any relation between their direction and the direction of the prevailing winds in these regions.
   Explain how currents aid in ocean transportation and distribution of temperature.

References:

Dryer, pp. 150–159; Salisbury-Barrows-Tower, pp. 226–255; Arey, pp. 195–215; Semple, *The Influences of Geographic Environment*, pp. 292–315; Gregory, pp. 6–18; Tarr, pp. 205, 213, 219

Conclusions:

1. Causes of storm waves
2. Economic relations of waves to coasts, harbors, etc.
3. Cause of tides and their periodic movements
4. Relation of tides to harbors and ocean traffic
5. Cause of ocean currents
6. Effect of ocean currents on distribution of temperature and on ocean travel and transportation

Related Problems:

1. Why do the tides come nearly an hour later each day?
2. What is meant by high and low, ebb and flood, spring and neap tides? Tell of tidal bores and their economic effects.
3. Locate and give the cause of the great eddies in the oceans.
4. How can the moon cause two tides at once?
5. How fast, how wide, and how deep is the flow of ocean currents? (See Longmans, p. 3.)
6. What is a Sargossa Sea?
7. Distinguish between ocean current and ocean drift. Illustrate.
8. Is sea-sickness more likely to occur in large or small boats? Why?
9. Tell of the value of breakers and undertow and their relation to each other.
10. Why do so many steamship lines converge near the mouth of many great rivers?

13. THE SEA AS A HIGHWAY

Purpose: Studying the evolution of navigation and how it has affected commerce and developed a sense of human kinship among the nations of the world

Problem: How has the conquest of the ocean influenced the spread and development of civilization?

Studying the Problem:

1. What motive power was used by Columbus in propelling his ships across the Atlantic? Why? How long did it take him to make the trip? Why was practically all ocean traffic before the time of Columbus limited to coastwise trade?
2. What motive power is used today on all important ocean-going vessels? How long does it take to go from New York to London? Compare the effect of storms on ocean-going vessels of today with the effect on those of one hundred or more years ago, and give reasons.
3. How does the volume and rate of exchange of goods over the seas compare with those of a century ago? Give reasons. How has the ocean cable and wireless telegraph influenced the relations between peoples of different continents?
4. Study the comparative cost of railway and ocean transportation. Likewise, study competition as affecting these means of transportation.

References:

Dryer, pp. 157–159 and 324; Salisbury-Barrows-Tower, pp. 226–255; Arey, pp. 212–215; Gregory, pp. 172–173; Smith, pp. 684–692; Robinson, pp. 26–28 and 74–77

Conclusions:

1. Causes of difference in the cost of land and sea transportation
2. Importance of the sea as a highway
3. Influence of modern motive power on the interrelation and interdependence of peoples
4. Place of the ocean cable and wireless as related to traffic on the sea
5. Cause of the ocean's becoming a great international highway instead of a great international barrier
6. Main directions of ocean traffic
7. Relation of winds and currents to ocean transportation

Related Problems:

1. What is meant by the neutralization of the seas, and what influences have brought it about?
2. Discuss the possibility of the sea serving as the home of man.
3. Do you consider the ocean a barrier or a stimulus to international progress and felicity? Why?
4. What relation do fogs and icebergs bear to ocean travel? Explain.
5. What is meant by "establishment of port"?
6. What are monsoon currents, and how have they affected ocean traffic?
7. Why is there so much strife among nations regarding coast lines?
8. Why should coastal cities be so ambitious to build high-class steamship terminals?
9. What is meant by line traffic and charter traffic on the seas?
10. What is a merchant marine, and what factors favor the building-up of a large one?
11. Why should Great Britain be so extensively engaged in the shipping business?
12. What is a "tramp" steamboat?
13. What is meant by ballasting a vessel, and what materials are used?
14. What are the principal barriers to world commerce and transportation?
15. Compare the oceans in respect to volume of traffic over them.
16. Contrast the nature of the east-and-west traffic as to commodities with that of the north-and-south traffic.
17. What determines the rates for ocean transportation?
18. Why are Honolulu and Samoa called "the crossroads of the Pacific"?

IV. THE SURFACE OF THE LAND: TOPOGRAPHY

PROJECT

This project seeks to develop the relation of the lay of the land and its possible production to the rise and development of the people who dwell upon it.

14. THE GEOGRAPHY OF LOWLANDS

Purpose: Investigating into the nature of lowlands and their relation to human progress

Problem: Why are lowlands the regions of greatest human activity?

Studying the Problem:

1. From physical maps of the world or the continents locate the principal lowland regions of the earth. On an outline map of the world color these lowlands in green. In connection with them study a map of the distribution of the population and state any relationship you find. Consider some of the great civilizations of the past and estimate what portion of them were found in lowlands.
2. Show how civilization is dependent on agriculture and how lowlands are well adapted to agricultural pursuits. How do facilities for land and water transportation and travel compare on lowlands with those on other types of topography?
3. What climatic factors need consideration when you are studying the relation of lowlands to human activity; for example, the lowlands of Siberia and the valleys of the Amazon and Congo?

4. In the appendix of your text find a list of the twenty-five largest cities of the world and see how many of them are not located near sea level on lowlands.

References:

Dryer, pp. 52–53; Salisbury-Barrows-Tower, pp. 489–512; Arey, pp. 360–362; Semple, *The Influences of Geographic Environment*, pp. 473–524; Robinson, pp. 17–18; Gregory, pp. 38–48; Tarr, p. 332

Conclusions:

1. Relation between elevation and density of population
2. Relation of lowlands to the building of highways and railways
3. Relation of lowlands to navigable rivers
4. Relation between the location of large cities and that of lowlands
5. Location of best agricultural lands in relation to lowlands
6. Why some lowlands are exceptions to the general rule
7. Climate of lowlands as compared with highlands
8. Lowlands and the world's food supply

Related Problems:

1. What do you know of the elevation of the region which cradled the Christian religion?
2. Name several kinds of plains and tell how each is made.
3. What proportion of the people of the world live below 1,000 feet elevation?
4. Why is the Laurentian peneplain an unproductive agricultural region?
5. Wherein lay the value of the great central plain of the United States?
6. Why does the density of population decrease as one goes eastward across Eurasia?

7. Contrast the human activity of the Amazon with that of the Mississippi Valley and give reasons.
8. Show why the basic occupation in California now is very different from what it was in the early history of the state.
9. Why are lowlands the regions in which commerce and manufacturing flourish best?
10. What are alluvial, lacustrine, and delta plains? Illustrate.
11. How were the Atlantic and Gulf coastal plains made?
12. Why have plains deeper and more fertile soils than plateaus or mountains?

16. THE GEOGRAPHY OF PLATEAU REGIONS

Purpose: Studying the economic and human relationships involved in adaptations to plateau environments

Problem: Why are plateau peoples likely to be lacking in progressiveness?

Studying the Problem:

1. Find out the relation in position and elevation of plateaus to plains and mountains, and state the relation these factors bear to accessibility, rainfall, temperature, etc.

   What can you say concerning the character of the surface, and how does this affect travel, communication, and transportation?

   Color the important plateaus of the world in orange or yellow on an outline map of the world.
2. Judging from a study of the rainfall on the principal plateaus of the world, what in general would be the status of agriculture and the consequent occupations of the people? Will or will not plateau regions support a dense population? Keeping in mind the answers to the preceding questions, how would you say that plateaus affect the intercourse of peoples among themselves and

with the rest of the world outside of their own habitat? See if you can now give a good answer to the problem.

References:

Dryer, p. 53; Salisbury-Barrows-Tower, pp. 485–486; Arey, pp. 366–375; Gregory, pp. 48–50; Robinson, p. 18; Semple, *The Influences of Geographic Environment*, Index; Tarr, p. 334

Conclusions:

1. How plateaus are made
2. Influence of age on the relief of plateaus
3. Cause of deeply intrenched streams in some plateaus
4. Origin of mesas, buttes, etc.
5. Climate of plateaus
6. Density of population on plateaus
7. Intercourse between plateau peoples
8. Interrelation and interdependence of plateau peoples
9. Character of the people in general

Related Problems:

1. Tell of the character and progressiveness of the people of the Mexican, Iberian, and Allegheny-Cumberland plateaus and how they serve to illustrate the problem.
2. How could you tell an uplifted peneplain from a plateau?
3. Why are houses in arid plateaus often built with flat roofs and thick walls? What building materials are generally used?
4. Why are the Cumberland and Allegheny plateaus usually called mountains?
5. How distinguish between mountains and plateaus?
6. Why is the Cumberland so much rougher than the Colorado plateau?
7. Study a vegetation map of plateau regions and explain cause and nature of vegetation found thereon.

8. Study a railroad map of the United States and see how many railroads there are on the Colorado, Columbia, and Cumberland plateaus and compare with the number on the plains of Iowa and Illinois. Give reasons for the difference.
9. Why have the Colorado and Columbia rivers cut such deep gorges in the plateaus through which they flow?
10. Explain the origin of the New England and Piedmont plateaus.

16. THE GEOGRAPHY OF MOUNTAINS

Purpose: Evaluating the influences that operate in the adaptation of life forms to a mountain environment and the responses to these forces

Problem: How do mountains sometimes promote and sometimes hinder progress in civilization?

Studying the Problem:

1. Locate and give direction and relative heights of the principal mountain ranges of the earth.
   How are mountains formed? (Name three ways.)
   Why are some mountains higher and some rougher than others?
   Explain how mountains may act as a barrier to plants, animals, and man in their movements, and upon what the effectiveness of the barrier depends.
2. Find out what you can concerning the relation between mountains and the distribution of temperature and moisture.
   On an outline map of the world color in brown the mountain regions of the earth.
3. Study the relations of mountains to mining, timber, power, irrigation, health, and recreation.

4. What influence do passes in mountains have upon their effectiveness as barriers to migrations of plants, animals, and man?
   On physical maps of North America and Europe locate and name some of the principal passes, and see if you can find anything of historical interest connected with any of them.

References:

Dryer, pp. 54–59; Salisbury-Barrows-Tower, pp. 465–485; Arey, pp. 376–401; Gregory, pp. 50–54; Herbertson, pp. 43–48; Semple, *The Influences of Geographic Environment*, pp. 524–607; Tarr, pp. 93–111; Brigham, *Geographic Influences in American History*, chap. iii

Conclusions:

1. Three ways in which mountains are formed
2. Effect of mountains on the migration of life forms
3. Mountains and the distribution of rainfall
4. Relation of mountains to the distribution of temperature
5. Mountains protecting people and nations
6. Mountains as a barrier to progress
7. Mountains as a storehouse for valuable human necessities
8. Relation of mountains to timberlands
9. Why mining is easy in mountains
10. Mountains in relation to health and recreation
11. Density of population in mountains
12. Mountains in their relation to power, irrigation, and boundary lines

Related Problems:

1. See if you can find how the passes of the Carpathians and the mountains themselves were a marked factor in the World War.
2. What route did Daniel Boone take when he emigrated over into Kentucky? How long after the first English settlement in America, and what was

the significance of the fact? (See Brigham, *From Trail to Railway through the Appalachians*, pp. 142–154.)

3. What would have been the effect on the development of the United States if the Appalachians had been as high as the Rockies or the Sierra Nevadas? What if the Appalachians had extended east and west in the latitude of New York City?
4. Tell how the southern Appalachians were used by the generals of the Federal and Confederate forces in the Civil War in screening the operations of their armies and raiding expeditions. (See Brigham, *Geographic Influences in American History*, pp. 218–229, and Semple, *American History and Its Geographic Conditions*, p. 290.)
5. Show how the Hoosac Mountains in western Massachusetts caused Boston to lose her place as the most important port on the eastern coast of the United States. (See Brigham, *From Trail to Railway through the Appalachians*, pp. 1–13.)
6. Compare and contrast the means of making a living on mountains and lowlands in the temperate and torrid zones.
7. Why are there fine forests on the west slope of the Sierra Nevadas?
8. Why is it so difficult to drive a mountain people out of their possessions? Illustrate by a concrete example.

V. THE SURFACE OF THE LAND: HYDROGRAPHY

PROJECT

In this project we expect to show how the waters of the land have been an important factor in the development of countries and the progress of peoples.

17. THE GEOGRAPHY OF RIVERS

Purpose: To study the life history of rivers and their rôle in the development of new regions

Problem: How does a river get its valley, what are the steps in its development, and how may man's interests be served at different stages of its evolution?

Studying the Problem:

1. If possible, study the effects of running water on a bare slope during or just after a rainstorm, or in the spring at the time of the melting of the snow.
2. How does a valley become deeper, longer, and wider?
3. What is the meaning of young, mature, and old streams and valleys?
4. How can man use a young stream? What factors limit its use for navigation?
5. At what stages in the life of a river can it serve the following interests of man best: transportation, power, fishing?
6. Which type of valley development serves man's interests best?

References:

Salisbury-Barrows-Tower, pp. 215–245; Dryer, pp. 72–112; Salisbury, pp. 73–148; Tarr, pp. 261–288; Semple, *The Influences of Geographic Environment*

Conclusions:

1. How a stream gathers and carries its load
2. Factors in the rate of stream erosion
3. Stages in the life history of a stream and its valley
4. How a stream becomes longer, wider, and deeper
5. How different stages of development affect human activity
6. Cause and effects of canons, gorges, falls, rapids, etc.
7. Cause and nature of stream deposits and their relations to man

Related Problems:

1. How is ground water related to permanency of streams?
2. How is elevation related to erosion by streams?
3. Upon what does the durability of stream-built features depend?
4. What are some of the features of a topographic map that would indicate the age of a stream?
5. Account for the importance of five of the greatest river systems of the world.
6. Contrast the importance of the Yangste River with that of the Mackenzie.

18. THE GEOGRAPHY OF LAKES

Purpose: To study the origin and value of lakes

Problem: How are lakes made, what becomes of them, and of what value are they to man?

Studying the Problem:

1. How were the numerous lakes of Minnesota and Canada formed? Where are other lakes that were formed in the same way?
2. Account for the lakes found in the valley floor of some old streams.

3. Explain the formation of volcanic lakes.
4. How are streams and lakes natural enemies?
5. What are finger lakes, how are they formed, and where may several be found?
6. What are the earmarks of fossil lakes?
7. What are some of the economic values of lakes?

References:

Dryer, pp. 103, 110, 124–128; Salisbury-Barrows-Tower, pp. 239, 246, 261, 264, 302; Salisbury, pp. 213–237; Arey, pp. 215–227; Tarr, p. 291; Semple, *The Influences of Geographic Environment*

Conclusions:

1. How glacial lakes are made
2. The making of ox-bow or horseshoe lakes
3. The making of volcanic lakes
4. Relation of streams to lakes
5. Determination of the site of fossil lakes
6. The economic value of lakes

Related Problems:

1. Account for the fossil lakes Agassiz and Bonneville.
2. What are the special values of the lakes of New England?
3. Why are the Great Lakes of the United States of so much importance?
4. Explain how vegetation operates in the destruction of lakes.
5. Why are some old lake beds very valuable for agriculture while others may be valuable for something else?
6. Account for the importance of five of the great lakes of the world other than the Great Lakes of the United States.
7. How did fresh-water Lake Bonneville change into the Great Salt Lake?

19. THE GEOGRAPHY OF UNDERGROUND WATERS

Purpose: To study the source, movements, and value of underground waters

Problem: In what ways is underground water of great value to plants, animals, and man?

Studying the Problem:

1. Define ground water, capillary zone, saturated zone, and water table.
2. Where does the water come from that goes into the ground after a rain?
3. What is a well, spring, artesian, or flowing well?
4. How does underground water circulate? How much is there of it?
5. How does deforestation lower the water table?
6. Why is ground water of so much importance to plants?
7. What causes the difference between good and poor wells? Constant and intermittent springs? High and low water table?

References:

Salisbury-Barrows-Tower, pp. 205–215; Dryer, pp. 132–135; Salisbury, pp. 45–72; Arey, pp. 270–283; Tarr, pp. 240–248

Conclusions:

1. Factors determining amount and rate of movement of underground water
2. Nature of the movement of underground water
3. Causes for difference in depth of water table
4. How and from where plants get water
5. Importance of ground water to man

Related Problems:

1. Account for the action of geysers and hot springs.
2. How are natural caves formed?
3. What are some of the interesting features of cavern life?

4. What are the factors that favor or hinder solution by ground water?
5. Describe the different methods of digging wells.
6. How important are lakes in furnishing water supply for cities?
7. Illustrate by means of drawings properly labeled the position of water table, capillary zone, saturated zone, spring, wells, marsh, lakes.
8. Why are rainy spells in spring more productive of floods than equally intensive rainy spells in autumn?
9. How deep may ground water extend? Give reasons for your answer.

VI. THE ATMOSPHERE

PROJECT

This project aims to develop the principles underlying the importance of air and its movements, the relation of the atmospheric envelope to the life forms dependent upon it, and to give sufficient practice in these principles to enable one to use them in everyday life.

20. COMPOSITION AND USE

Purpose: Studying the composition of the air and the value of its component parts in the economy of plant and animal production

Problem: What are the principal elements of which the air is composed, and how is life on earth affected by each?

Studying the Problem:

1. What is the air composed of, and what is the average percentage of each part? Explain the cause of haziness of the air at times and why it is worse at some times than others. By what means is disease carried in the air?
2. What element of the air is the most essential to man and animals, and what is the use of this element in the body? When a piece of wood burns, how is the air involved in the process? In what way is air involved in the rusting of iron or the decay of organic matter? How is the supply of this element kept up?
3. Which gas of the atmosphere is the most useful to plant growth, and from where does the constant supply come?
4. Explain how nitrogen is useful to plant and animal life and see if you can find out how plants and animals get their supply of this element.

5. The other important gas of the atmosphere is water vapor. What is its chief use, and how is the supply kept up?

References:

Dryer, pp. 172–174; Salisbury-Barrows-Tower, pp. 44–54; Arey, pp. 65–72; Gregory, p. 93; Milham, *Meteorology*, pp. 6–17; Dodge, pp. 42–43; Tarr and McMurry, Book I, p. 54

Conclusions:

1. Position of the atmosphere
2. Composition of the atmosphere
3. Principal function of each component part of the atmosphere in plant and animal economy
4. Means by which a constant supply of each element is kept up

Related Problems:

1. Why does the total quantity of carbondioxide in the air vary during the year, i. e., from summer to winter?
2. Compare the quantities of carbondioxide in the air in city and country, and state how equalization may take place.
3. The newest electric incandescent lamps are filled with nitrogen instead of being made a vacuum. Give reasons. Why are they not filled with oxygen?
4. What can you say of the advisability of keeping plants in a sleeping room?
5. How can rain purify the air?
6. Why do we ventilate our houses? Give evils of poor ventilation.
7. Why is it not correct to say that "the earth is surrounded by air"?
8. What would be the effect of a greatly increased quantity of oxygen or carbondioxide in the air?

9. Why is a candle so quickly extinguished when in a closed glass jar? How may this be used to show the need of ventilation in living and sleeping rooms?
10. Why do lamps need to be ventilated? What makes a lamp or stove sometimes "smoke"?
11. Why is silver less subject to rust than steel cutlery?
12. Why will a jar of fruit spoil after it has been unsealed unless it is soon consumed?
13. Why is a surgeon so careful about sterilizing his instruments and all other accessories used when performing an operation?
14. Explain why it is necessary to disinfect and fumigate buildings in which there have been persons with contagious diseases.
15. Why do plants thrive better than animals in hot marshy lowlands?
16. Explain why country air is freer from impurities than city air.
17. How is it known how high the air extends?
18. Why is nitrogen so important in the manufacture of high explosives?
19. Why do most of the compounds in nature have some oxygen in them?

21. ELASTICITY OF THE AIR

Purpose: Studying the influence of variations in temperature upon the volume and weight of air

Problem: How do you explain the fact that the air at the top of a room is not the same temperature as that near the floor?

Studying the Problem:

1. Find some way of showing that air, when warmed, changes as to the amount of space it occupies. Like-

wise devise some scheme for showing that a change in volume occurs when air is cooled.

2. Determine, if you can, which is heavier, a given quantity of warm air or the same quantity of cold air.
3. Find some means of showing that air when warmed is crowded into a new position by the surrounding cooler air.

References:

Dryer, pp. 174–180; Arey, pp. 73–90; Milham, pp. 26–60; Dodge, pp. 43–46; Tarr and McMurry, pp. 207–280; Salisbury-Barrows-Tower, pp. 55–83

Conclusions:

1. Effect of increased or decreased temperature on the volume of a given quantity of air
2. Comparison of equal volumes of cold and warm air as to weight
3. Position assumed by any body of warm air when surrounded by air which is colder
4. Reason for air in the top of the room being warmer than that near the floor

Related Problems:

1. Why does a balloon rise, and upon what property of air does its behavior depend?
2. What is there about air that enables a bird or an aeroplane to fly in it?
3. What is the principle upon which the Westinghouse air brake depends?
4. Why does air expand when heated and contract when cooled?
5. How is it possible to make an automobile or bicycle tire so hard by means of air?
6. Why is an inflated basket-ball harder in a warm room than in a cold room?
7. What effect do the expansion and contraction of air have on the ventilation of the soil?

8. Explain the principle of the thermostat, or heat regulator, such as is used in incubators.
9. Describe a thermometer and how it operates.
10. What is a thermograph?

22. WEIGHT OF THE AIR

Purpose: Developing the fact that air has weight and showing the relationships that this property of air has to some common phenomena connected with human activities

Problem: At sea level the air presses down more than a ton on every square foot. How can you show that air can exert pressure, and in what ways are we influenced by it?

Studying the Problem:

1. What amount of pressing down can you do when standing on the platform of a scales? Any object that can exert pressure on the scales is said to have what property? What is the weight of the air at sea level?
2. Fill a glass tumbler full of water, cover it with a piece of glazed paper, and, holding the paper on firmly with the palm of the hand, quickly invert the glass and carefully remove the hand from the paper. Why doesn't the water push the paper off?
3. Find other ways of proving that air has weight.
4. Describe an instrument for accurately measuring the weight of the air.
5. How does air pressure on highlands compare with sea-level pressure? Explain in full.

References:

Dryer, pp. 181–184; Arey, pp. 91–98; Salisbury-Barrows-Tower, pp. 102–125; Dodge, p. 46; Milham, pp. 114–123; Tarr and McMurry, pp. 207–210

Conclusions:

1. Amount of pressure at sea level in pounds per square inch
2. Relation of altitude to air pressure
3. Direction of air pressure
4. Relation of increased or decreased temperature to air pressure
5. Volume of air as related to pressure
6. Volume of air as related to temperature
7. Relation of barometer reading to altitude

Related Problems:

1. Why does the air pressure at a given place change?
2. What is an aneroid barometer, and how is it constructed?
3. How can a barometer be used for measuring altitude?
4. What is meant when we say the air pressure is 29 inches?
5. Why use mercury rather than some other liquid in the construction of barometers?
6. If the mercury in the thermometer should rise, how would you expect the mercury in the barometer to behave?
7. Why is it more difficult to cook potatoes at Pike's Peak than at San Francisco?
8. Why does one breathe more deeply in high altitudes than at sea level?
9. Explain why it would be impossible to use a suction pump in a well 35 feet deep.
10. Is it necessary or not that a mercurial barometer be held in a vertical position when read? Explain. Must the aneroid be held in any particular position?
11. If a closed bottle full of air be *cooled*, the pressure on the inner surface is decreased, but if the stopper

is removed, the *warming* of the outside air decreases the pressure on the inner surface. Explain why this is true.

12. What is a barograph?

23. SOURCE, EVAPORATION, AND LATENT HEAT OF ATMOSPHERIC MOISTURE

Purpose: Studying the facts and principles concerned in the evaporation of moisture into the air

Problem: How does moisture get into the air, from where does it come, how much can it hold, and how is the temperature of bodies from which it comes affected?

Studying the Problem:

1. Explain the change that takes place when the water in the teakettle is caused to disappear by heating. Consider the same process at lower temperatures and give three important examples. Name several factors involved in the rate of evaporation.
2. How much change in volume takes place when water is changed into water vapor?
3. Find a table showing the capacity of air for moisture at different temperatures. Note the change in capacity as the temperature is raised or lowered.
4. Put two or three drops of alcohol or ether on your hand and explain the temperature effect as the liquid evaporates.
   Where is the heat that left your hand?
   Find several means of illustrating this same effect when water evaporates. (Use the thermometer if you wish.)
5. Study the hygrometer, maximum and minimum thermometer, and dew-point.

References:

Dryer, pp. 193–194; Salisbury-Barrows-Tower, pp. 84–89; Arey, pp. 117–120; Milham, pp. 191–194; Harrington, *About the Weather*, pp. 69–72

Conclusions:

1. The force causing evaporation
2. Three or four sources of supply of atmospheric moisture
3. Factors involved in the rate of evaporation
4. Change in the volume of water when changed to water vapor
5. Influence of temperature on capacity of air for moisture
6. Influence of evaporation on temperature of objects from which it took place
7. Meaning of latent heat of vaporization

Related Problems:

1. What is the molecular theory, and how is it useful in explaining the change of water to steam or water vapor?
2. Why does a piece of iron expand when heated? Illustrate.
3. Compare the quantity of water evaporated from the soil with that transpired by plants.
4. Why is one in danger of "catching cold" when wearing wet clothing?
5. Why is a breeze on a hot day so refreshing?
6. How does a doctor generally "break a fever"?
7. Explain how a canvas water container keeps the water in it cool on a hot day.
8. What is a calorie of heat? How many does it take to evaporate a cubic centimeter of water? A pint?
9. How does a plant keep cool on a hot day?
10. Upon what principle does the action of a steam engine depend?
11. Why does the visible moisture from the steam engine or the breath soon disappear?
12. What is relative humidity? Saturation?
13. Warming saturated air has what influence on its capacity for moisture?

14. Can evaporation take place below the freezing point? Illustrate.
15. Why do lakes and rivers cool so much more quickly in the autumn than they warm up in the spring?

24. CAUSES OF CONDENSATION OF ATMOSPHERIC MOISTURE

Purpose: Learning the principles underlying the formation of fog, rain, snow, dew, frost, and clouds

Problem: What is the cause of the different forms of precipitation, and how is the temperature of the air affected by the condensation of moisture?

Studying the Problem:

1. Recall the capacity of air for moisture at 60 degrees F. If the temperature is lowered a little, what must happen to some of the moisture? What if the temperature is lowered a large amount, say 10 degrees or 15 degrees?
2. What must result if saturated air at 20 degrees F. — that is, below the freezing point — has its temperature lowered a small amount? A large amount?
3. What is dew, and above what temperature, only, can it be formed? What is frost, and below what temperature, only, can it be formed?
4. Explain and demonstrate, if possible, four different means by which condensation of atmospheric moisture may take place.

References:

Dryer, pp. 194–198; Salisbury-Barrows-Tower, pp. 88–100; Arey, pp. 118–128; Harrington, chaps. xi, xii; Milham, pp. 233–243

Conclusions:

1. Effect of lowering the temperature of saturated air
2. Conditions for the formation of fog, of rain, and of snow
3. Conditions for the formation of dew and of frost

4. Four factors causing necessary cooling for condensation
5. Effect of condensation on the temperature of the air

Related Problems:

1. What is the cause of the fog at the opening of a teakettle of boiling water? Why can you sometimes "see your breath"? Why not always?
2. Why is the relative humidity of the air usually higher at night than in the daytime?
3. Why doesn't dew or frost form on a cloudy or windy night?
4. Why are lowlands more subject to frosts than the uplands?
5. What causes the condensation of moisture in the common thunder clouds?
6. Why does the rain that sometimes starts to fall from a cloud fail to reach the earth?
7. Why doesn't frost or dew form under trees and bushes?
8. Why does the temperature often rise when the snow begins to fall?
9. Recall what became of the heat that was required to evaporate the water. Infer what becomes of this heat when the water vapor is condensed.

25. MOISTURE CONTENT OF THE AIR IN RELATION TO PRESSURE

Purpose: Finding out the relation of the amount of moisture in the air to its weight, and discovering how such conditions seem to influence the barometer and weather

Problem: What is commonly said concerning the weight of the air when it seems very damp and the smoke

from the chimney is observed to descend to the ground? Is this saying a true one or not?

Studying the Problem:

1. What is true concerning the temperature and weight of the air that brings the smoke from the chimney? Why? Recall why a rock sinks in water and infer why this hot, smoke-laden air from the chimney comes to the ground.
2. On what kind of days does the smoke rise to great heights, clear or cloudy? Why?
   See if you can add to your reason for the smoke coming down under the conditions stated in the problem.
3. Find out how the barometer behaves when the smoke comes down, and explain.
4. Do you find any error in the popular saying as to the weight of the air under the conditions stated in the problem?

References:

Salisbury-Barrows-Tower, p. 88; Dryer, pp. 193–194; Milham, p. 191; Arey, pp. 117–118

Conclusions:

1. Relation of humidity to air pressure
2. Cause of smoke coming to the ground on damp days
3. Effect of increased humidity on height of the barometer
4. Reliability of common sayings
5. Two important factors influencing the weight of the air

Related Problems:

1. A cubic foot of water weighs 480,000 grains.
   A cubic foot of dry air weighs 571 grains.
   A cubic foot of water vapor weighs 282 grains.
   Compute the comparative weight of (*a*) water and dry air, (*b*) water and water vapor, (*c*) dry air and water vapor, (*d*) dry air and a mixture of dry air and water vapor.

2. What influence have evaporation and condensation of moisture on the temperature of the region in which they take place?
3. According to your results in (1), how many cubic feet of dry air would be required to weigh one pound? (1 lb. equals 7,000 grains.) How much water vapor? How much of an equal mixture of dry air and water vapor?
4. What effect has cooling or warming air on its relative humidity?
5. Why do morning fogs usually disappear before noon?
6. What factors cause the air to become lighter? Heavier?
7. Why do fogs often form in valleys when there is none on the uplands?
8. How do fogs differ from clouds? What becomes of clouds and fogs? Do they exist forever? Explain.

26. THE CAUSE OF WINDS

Purpose: Studying the cause of winds and learning the principles underlying their movements

Problem: Where do winds come from, where do they go, and where do they stop?

Studying the Problem:

1. What have you learned concerning the influence of differences of temperature and moisture content on the weight of air? By what means is this weight or pressure measured?
2. Secure a cigar box with a closely fitting lid so it will be air-tight. Cut three holes, about one and one-half inches in diameter, four inches apart in the lid. Set lamp chimneys over each of the holes and place a short candle in the middle one. By means of this apparatus

show and explain how air moves and when movement ceases. (Use a bit of "smoke paper" to discover the direction of air currents.) Find other means of showing that air moves. Get a good definition for wind.

3. If the air in your county is lighter than in the surrounding counties, how will this surrounding air influence the air in your county?
   Make two sketches of the counties in question, one an areal and one a vertical section. On these sketches indicate by means of arrows the direction of movement of the air in the different parts of the drawing.
4. What is the answer to the problem?

References:

Dryer, p. 184; Salisbury-Barrows-Tower, pp. 106, 107, 128; Arey, pp. 99–103; Milham, pp. 136–164; Holtz, pp. 263–264; Gregory, p. 99

Conclusions:

1. Causes of winds
2. Factors determining the direction of winds
3. Causes of calms (three)
4. Definition of wind
5. Causes of different velocities of the wind

Related Problems:

1. Oxygen, nitrogen, and carbondioxide are not the same in weight. Why is the heaviest not found at the bottom and the lightest at the top of the atmospheric envelope?
2. Explain the hot-air system of heating buildings. Show by a drawing.
3. How are whirlwinds caused?
4. What effect do high altitudes have on the action of a steam engine? Of a gas engine?
5. Why does the wind blow harder sometimes than at others?

6. Explain by a drawing the conditions necessary to cause a south wind. A calm.

27. THE WIND AND CALM BELTS OF THE WORLD

Purpose: Studying the causes of the wind and calm belts of the world

Problem: What are the conditions which warrant the division of the world into planetary belts of winds and calms?

Studying the Problem:

1. Find and explain the location of the heat equator. Study to learn the movements of the atmosphere at and near the heat equator and determine the extent of this movement. Are they high-pressure or low-pressure belts?
   Find the names and the exact location of the three belts studied in this paragraph.
2. Determine what becomes of the air that rises in the hot belt of equatorial calms.
   What names are applied to the two belts along the tropics and are they high-pressure or low-pressure belts?
   Determine the location and account for the direction of the prevailing westerly winds.
   Study the cause and direction of the circumpolar winds.
3. Draw a four-inch circle and let it represent a section of the earth through the axis. Also draw a horizontal line through the center for the equatorial diameter. Just outside this circumference represent in vertical section, by means of arrows, the direction of the air in each of the belts studied above, and label each belt carefully.
4. Draw another four-inch circle to represent a hemisphere of the earth. Draw through the center a horizontal line to represent a semi-equator. Draw, also, lines to represent tropics and polar circles. On this diagram

show by means of arrows the surficial movement of the winds in the various wind belts of the world and write their names carefully in the proper places.

References:

Dryer, pp. 189–190; Salisbury-Barrows-Tower, pp. 112–113; Arey, pp. 101–105; Milham, pp. 165–177; Holtz, pp. 263–264; Gregory, p. 95; Dodge, pp. 47–49; Mill, pp. 72–78

Conclusions:

1. Cause for the location of the heat equator
2. Cause for the upward movement of air in the belt along the heat equator
3. Why the equatorial calms are a low-pressure belt
4. Cause of the pressure conditions in the tropical calm belts
5. Cause of the veering of the planetary belts of winds
6. Cause of the steady, constant movements of the trade winds
7. Relation of wind and calm belts to the distribution of heat, and equalization of the gaseous components of the air in different parts of the world

Related Problems:

1. Why are the trade winds more regular over the sea than over the land?
2. Which blow the more steadily, the winds near or those far above the earth's surface?
3. Why do fires burn better in cold than in warm weather?
4. What difference between natural and forced ventilation of buildings?
5. How get the best ventilation of a room by means of the windows only? Why?
6. What is the significance of the term "planetary belts of winds and calms"?

7. Is there any difference in the amount of force exerted by a cold wind and a warm wind if they are each blowing forty miles an hour? Explain.
8. In what parts of the world would the power derived from winds be the most reliable and constant?
9. Why is there a constant low-pressure area near the equator and constant high-pressure near the tropics?

28. MOISTURE CONDITIONS IN THE INTERTROPICAL AND SUBTROPICAL BELTS

Purpose: To work out the relation of wind and calm belts to rainfall

Problem: Why is there such a great difference in the amount of rainfall in the equatorial and tropical calm belts, and how account for the low rainfall in the trade-wind belts?

Studying the Problem:

1. Consult a rainfall map of the world and determine the comparative amounts of rainfall in the three belts.
2. Consider the temperature conditions of the air in the trade-wind belts as it advances toward the heat equator and explain how this influences its capacity for moisture.
   Give your conclusions as to why the trade-wind belts are dry.
3. Consider the quantity of water vapor held by the ascending currents of air in the doldrum belt and give your conclusions and reasons for the moisture conditions in this belt as noted in (1) above.

References:

Dryer, pp. 217–218; Salisbury-Barrows-Tower, pp. 159–171; Arey, pp. 150–154; Milham, pp. 254–255; Tarr, pp. 279–285

Conclusions:

1. Cause of heavy rainfall in the doldrum belt
2. Reason for dry climate of the trade-wind belts
3. Why the horse latitudes are so dry
4. Reason for the wet spots in the trade-wind belts
5. Cause of heavier rainfall on the eastern coasts in the trade-wind belts than on western coasts

Related Problems:

1. Explain the heavy rainfall on the east coast of Central America.
2. Why do the eastern coasts in the trade-wind belts have a more equable climate than the western coasts?
3. Why is there such heavy rainfall on the southeast coast of Brazil and in the Guianas?
4. Why is there a heavier rainfall on the east coasts of Australia and Madagascar than on the west coasts?
5. The north coast of the West Indies has a heavier rainfall than the south coast. Why?
6. Explain the cause of the great Sahara Desert.
7. Note the difference in the amount of rainfall on the east and west coasts of South America in the latitude of 20 degrees south and explain.
8. Note the exceedingly heavy rainfall in western Brazil and explain.
9. Why doesn't the exceedingly wet belt along the equator in South America extend to the Pacific Ocean?
10. Compare the rainfall of northeastern South America with that of the northeastern coast of Africa and explain the difference.
11. Contrast the rainfall of the east and west coasts of South Africa and explain.

29. THE WINDS OF THE WESTERLIES

Purpose: To study the peculiarities of the areas of high and low pressure as related to winds

Problem: Why is our country one of variable winds?

Studying the Problem:

1. Get a series of weather maps from your text or from the Weather Bureau showing the weather conditions for several consecutive days.
2. Find areas marked "low" and "high" on the map. What do these terms mean?
   Find a low on the west margin of the map of the earliest date and trace its path during the dates following. Get its direction and the time it takes to cross the continent.
   In like manner follow up one of the highs.
   Construct a diagram showing the direction and rate of movement of several highs and lows for several successive days.
3. Conceive a north-and-south line and an east-and-west one to be drawn through the center of each of the areas of low pressure. Study the direction of the wind in each of the quarters or quadrants of the low.
   In the same manner study the areas of high pressure.
   Construct diagrams, both areal and vertical, using arrows to indicate the air movements in both highs and lows.
4. As a low crosses the area in which you live, what will be the direction of the wind in your vicinity as the low is (*a*) west of you, (*b*) over you, (*c*) east of you?
   In like manner work out the direction of the wind if the low passes either north or south of you.
   Work out the wind directions for highs as you have for lows.

References:

Dryer, pp. 189, 198–206; Salisbury-Barrows-Tower, pp. 128–138; Arey, pp. 108–113; Milham, pp. 283–320; Tarr, pp. 262–265; Dodge, pp. 52–55

Conclusions:

1. Direction of wind spiral in relation to highs and lows in the Northern Hemisphere; in the Southern Hemisphere
2. The cause of the spiral circulation of the winds in the westerlies
3. Direction of winds in relation to highs and lows
4. Velocity of winds in relation to differences in barometric pressure
5. Why ours is a country of variable winds
6. Cause of calm days in our region
7. Why highs and lows move eastward and their rate of movement

Related Problems:

1. On a sheet of paper place a small circle and let it represent your home town. One inch to the left draw a northeast-southwest line four inches long. Divide this line into four equal parts and mark the points of division and the ends of the line L_1, L_2, L_3, L_4, and L_5. These five L's represent the location of five areas of low pressure as related to your home town.

   Now, through your home town draw an arrow toward L_1, also toward L_2, L_3, etc. These arrows show the direction of the wind in your location with the lows in different positions west of you.

   In like manner represent wind direction in your home location after these lows have passed to the east of you. These arrows indicate "wind-shift lines."
2. Draw wind-shift lines for a passing area of high pressure as you did in (1) above for the low.
3. Draw wind-shift lines for both highs and lows for Buenos Aires.

4. Explain how a southeast wind is a part of a storm approaching from the west.
5. What conditions would give us a wind shift from the south to northwest by way of west? By way of east?
6. What conditions would give the reverse of the above wind shifts?

30. HIGHS AND LOWS IN RELATION TO TEMPERATURE

Purpose: Working out the relation of highs and lows to changes of temperature

Problem: Why is the northern part of the Mississippi Valley subject to such sudden changes of temperature?

Studying the Problem:

1. Secure three or four weather maps for as many consecutive days. Conceive vertical and horizontal lines drawn through the centers of each of the highs and lows.
   Arrange a form in which to tabulate the temperature in each of the quadrants of six or eight lows and as many highs.
   Add up the different columns of temperature for the different quadrants and account for the differences.
2. Note the direction of the bending of the isotherms in relation to areas of low pressure.
   Find an isotherm that passes just south of the center of a high. Follow it until it passes the nearest low. Does it pass to the north or south? Explain.
3. Study barographic and thermographic records for the same week and see what the relation is that exists between pressure and temperature. (See Dodge, *Advanced Geography.*)

References:

Dryer, pp. 201–206; Salisbury-Barrows-Tower, pp. 136–138; Tarr, pp. 265–266; Arey, pp. 142–144; Milham, pp. 283–299; Dodge, pp. 52–55

Conclusions:

1. Relation of highs and lows to temperature
2. Warm and cold quadrants of lows
3. Cause of highs being cold
4. Course of isotherms in relation to highs and lows
5. Cause of frequent rapid falling of the temperature on continental areas in middle latitudes

Related Problems:

1. Make an areal drawing of the atmospheric movements in a high and a low adjacent to each other, showing by means of arrows the direction of the winds, and writing in the relative temperatures in the different quadrants.
2. How account for a warm southeast wind followed by a calm and a cold northwest wind?
3. What are tornadoes? How caused?
4. What are hot winds, and what causes them.
5. Explain chinook and foehn winds.
6. What conditions cause a cold south wind?
7. What is a thermograph, and how is it constructed?
8. Why is a uniform bore necessary in a thermometer? Is the same true in the case of the barometer?
9. Why is a cloudy day in winter warmer and in summer cooler than a clear day?
10. Explain the temperature conditions at your home attending the passing of a low to the south of you. Tell about the wind shift also.

31. PRECIPITATION IN THE WESTERLIES

Purpose: Studying the conditions causing precipitation in the belts of westerly winds

Problem: Why do our storms so often come from the northwest against a south or southeast wind?

Studying the Problem:

1. From a number of weather maps study the precipitation in the different areas of high and low pressure.
   In connection with this recall the wind direction in the different quadrants of lows and highs.
2. After determining which generally gives precipitation, highs or lows, recall the direction in which the storm center moves and the shifting of the wind in your locality as one of the storm areas approaches.
   Now, find your reason for the conditions stated in the problem.
3. Describe carefully the weather conditions as to temperature, wind, precipitation, and pressure changes preceding, attending, and following a typical storm in the belt of westerly winds.
4. Study Figs. 412 and 417 in Tarr in connection with this problem. Copy the diagrams in your notebooks and explain them in full.

References:

Dryer, pp. 200–203, 213; Salisbury-Barrows-Tower, pp. 130–132; Milham, pp. 283–287; Arey, pp. 142–144; Dodge, pp. 51–55; Tarr and McMurry, pp. 214–216

Conclusions:

1. Moisture condition of the atmosphere in lows
2. Moisture condition of the atmosphere in highs
3. Why storms from the northwest often come up against the wind
4. Cause of thunderstorms
5. Reliability of long-range forecasting

Related Problems:

1. Why is it that when it is raining the air is hardly ever saturated?
2. Why does one become chilled in wet clothes more quickly than in dry ones?

3. Why is the relative humidity of the air usually higher near the earth's surface at night and lower during the daytime than at an elevation of 100 or 200 feet?
4. Why does frost form on the windows of living rooms and not on those of unoccupied rooms?
5. Why does the relative humidity of the air decrease as the day advances until about 2:00 P. M. and then increase until morning?
6. Why is the "laying" of the wind or the clearing of the sky in the evening conducive to frost or dew?
7. How is rainfall shown on a map? (Name two or three ways.)
8. Where do the storms originate that give rain to the agricultural regions of the north-central states of the United States?
9. Why is the appearance of a clear sky on the northwestern horizon regarded as a sign of fair weather?
10. Bring to class a list of six weather proverbs and be able to give an opinion as to their scientific basis. (See Milham, Index.)
11. Why is a low rather than a high a storm center?

32. WEATHER FORECASTING

Purpose: Studying a few of the more essential factors in weather forecasting

Problem: How can each of us from the existing weather conditions and the daily weather map forecast the weather quite accurately for a day or two ahead?

Studying the Problem:

1. Find out the four important factors that go toward making up the weather. Recall how each of these four factors is represented on a weather map.

2. What are the different features of highs and lows that must be kept in mind in order to predict what the weather of the next twenty-four hours may be? (Give at least six of them. See Milham, p. 384, and Salisbury-Barrows-Tower, pp. 130–134.)
3. Study the latest available weather map and, keeping in mind the rules studied in (2) above, forecast the weather for your locality for the next twenty-four hours and tabulate your work below.

WEATHER CONDITIONS

	TODAY	FOR TOMORROW		
		My Forecast	Bureau's Forecast	Actual Conditions
Temperature...				
Pressure.....				
Wind direction .				
Wind velocity..				
Condition of sky				

References:

Dryer, pp. 199–206; Salisbury-Barrows-Tower, pp. 130–134; Arey, pp. 142–143, 145–148; Milham, pp. 383–384; Dodge, pp. 52–54

Conclusions:

1. Direction and rate of movement of highs and lows
2. Main factors involved in weather forecasting
3. Percentage of accuracy by forecasting bureau
4. Weather conditions in lows
5. Weather conditions in highs
6. Why forecasts do not always come true
7. Why accuracy in long-range forecasting is impossible

Related Problems:

1. Formulate a rule for forecasting the temperature when the isotherms are (*a*) far apart and extending east and west, (*b*) close together and extending east and west.
2. Why are stockmen on the plains interested in the weather forecasts?
3. How are we to know whether a prediction has been a success or a failure?
4. What do you think of long-range forecasts as given in almanacs?
5. Wherein did your forecast differ from the one given out by the weather bureau? How do you account for the difference?
6. Wherein did your forecast and also that of the weather bureau miss actual conditions? Can you account for the differences?

33. MIGRATION OF PLANETARY BELTS OF WINDS AND CALMS

Purpose: Studying the cause and effects of the latitudinal movements of the wind and calm belts of the world

Problem: Why isn't the heat equator found in the same place in the winter that it is in the summer, and what effect does its north-and-south movement have on the location of the belts of winds and calms at different times of the year?

Studying the Problem:

1. On an outline map of the world locate in red ink the position of the heat equator in July and in blue or black its location in January. (See Dryer, pp. 178–179.) Explain the change in position.

2. Work out the effect this movement would have on the location of the equatorial calms, and consequently on the belts of trades, horse latitudes, and westerlies at different times of the year.
3. Study the bending of the heat equator in winter and summer as it crosses the continents and suggest causes for its behavior.
4. Using the table on page 170 and the figure on page 171 in Milham, show on an outline map of the world how the wind and calm belts of the world migrate and overlap.

References:

Dryer, pp. 189–192; Salisbury-Barrows-Tower, pp. 112–113; Arey, pp. 150–154; Milham, pp. 169–177; Tarr, p. 259; Dodge, pp. 48, 50

Conclusions:

1. Why the heat equator migrates north and south
2. Bending of heat equator in crossing the continents
3. Cause of heat equator bending poleward in the summer when crossing the continents
4. Why the doldrums move north and south
5. Directions of winds at different times of the year where the trades and doldrums overlap
6. Directions of the winds at different times of the year where the horse latitudes and trades overlap

Related Problems:

1. Study the monsoon winds of India and show how they are a result of migrations of the heat equator.
2. Why are the summer monsoons of India from the southwest rather than from the southeast?
3. Study the direction of the winds in the Gulf of Mexico on the two maps, page 191 of Dryer, and account for the differences. (See Bartholomew, *Atlas of Meteorology*, Plate XIV.)

4. Note the difference in direction of the winds in northern Australia on the same two maps and account for the contrast.
5. Likewise explain the contrast on the southwest coast of Africa and the east coast of China.
6. Note whether the winds blow toward or away from the interior of North America in winter and summer and explain any difference you find.
7. Why are California and Florida more likely to have westerly winds in winter than in summer?

VII. CLIMATIC TYPES AND THEIR CORRELATIVES

PROJECT

The climate of the Americas is so varied and interesting in all its elements that a thorough understanding of its several types constitutes a sufficient basis for the interpretation of the climate of any part of the world. This project is concerned with the task of developing a working knowledge of the climatic types of the Western Hemisphere and their correlatives in other parts of the world.

34. AMAZON TYPE, OR EQUATORIAL OR DOLDRUM CLIMATES

Purpose: To learn the characteristics of the equatorial or doldrum climate and how it influences life and human activity

Problem: How do you account for the dense, continuous growth of vegetation and the low state of human society in the valley of the Amazon River?

Studying the Problem:

1. From a physical map of South America find out concerning the latitude, topography, and hydrography of this region.
2. Study maps and texts concerning the plant and animal forms, including man. What seems to be the prevailing type of each?
3. Find out from temperature and rainfall maps what is true as to maximum and minimum temperature with seasonal variations, and total and seasonal distribution

of rainfall. Give causes in full. (See table entitled "Temperature, Cloudiness, and Wind Belts of the Climatic Regions of America," p. 113.)

4. What can you find concerning the general healthfulness and ambition of the people of this region? Give some causes.
5. What incentives are found which lead to frugality, industry, and progressiveness?
6. On an outline map of the world delineate this region and color it in red. Also on this same map indicate in red two other regions with similar climate. (See Dryer, pp. 329–330.)

References:

Dryer, pp. 329, 335, 491; Gregory-Keller-Bishop, pp. 113–114; Salisbury-Barrows-Tower, pp. 160–165; Herbertson, *Man and His Work*, chap. v; Mill, pp. 868–873; Milham, p. 168; Herbertson, *Senior Geography*, p. 349; Bartholomew, *Atlas of Meteorology;* Bowman, *South America*

Conclusions:

1. Cause of high temperature in the doldrum belt
2. Reason for high rainfall in this belt
3. Cause for highly colored plumage of birds
4. Why temperature varies so little
5. Why the natives do not have the progressive spirit
6. Cause of this region's being unhealthful for foreigners
7. Cause of rather even distribution of rainfall
8. Cause for rank, dense vegetation
9. Average barometric pressure in this region, with causes
10. Why the daily range of temperature is greater than the annual

Related Problems:

1. How do you account for the large amount and seasonal distribution of rainfall on the "Gold Coast"?
2. Why is the region around the source and course of the Congo River so unhealthful and called the "White Man's Grave"?

3. Why are the highest temperatures not always found on the equator?
4. Explain the location and relation of a place to the doldrum belt in order that it have two rainy and two dry seasons.
5. Why is there not a desert region east of the Andes Mountains as there is east of the Sierra Nevadas in North America?

35. CARIBBEAN TYPE, OR TRADE-WIND AND MONSOON CLIMATES

Purpose: To study the conditions that influence the making of the Caribbean type of climate and the life of that region

Problem: Why was the climate the worst obstacle in the construction of the Panama Canal?

Studying the Problem:

1. Find all you can about the history of the Panama Canal idea. What elements contributed to the failure of the French in their attempt to dig the canal?
2. From physical, temperature, wind, and rainfall maps of this region, study the lay of the land as related to drainage, rainfall, temperature, and wind. Study the annual and seasonal distribution of temperature, rainfall, and winds.
3. What native and cultivated vegetation results from the conditions found in (2)?
4. How are the facts assembled in (2) related to health and disease, and what of their influence on the habits of the people?
5. What means did our government use in overcoming the difficulties found?
6. To the map used in the preceding problem add the Caribbean type of climate and also two other regions that are correlative with this one. Color in red.

References:

Dryer, pp. 328–335, 485;[1] Salisbury-Barrows-Tower, pp. 105–108; Gregory-Keller-Bishop, pp. 114, 328, 349; Milham, p. 168; Herbertson, ***Man and His Work;*** Bartholomew, ***Economic Atlas;*** Bartholomew, ***Atlas of Meteorology;*** Herbertson, ***Senior Geography***, pp. 323–326

Conclusions:

1. How the French failed in digging the canal
2. Seasonal distribution of temperature, winds, and rainfall. Causes
3. Sanitary and health factors involved in regions of this type
4. Vegetation resulting from this type of climate
5. Other climates in the world like this one
6. Distinguishing features of Caribbean climate

Related Problems:

1. Why does San Juan on the north shore of Porto Rico get a much heavier rainfall than Ponce on the south shore?
2. Account for the summer rainfall and winter dry weather of Indo-China.
3. Account for the naming of the trade winds.
4. Why is there no desert in subtropical South America east of the Andes?
5. Account for the seasonal wind directions in India and the far-reaching effects of them.
6. What is the explanation for the seasonal distribution of rainfall on the "Gold Coast" of Africa?

36. MEXICAN TYPE, OR HORSE LATITUDES AND TRADE-WIND CLIMATES

Purpose: To learn about the climate of the transitional region between the horse latitudes and trade winds and the possibilities of life there

Problem: Why is northern Mexico called the "Land of the Cactus," and what are the climatic factors that cause such conditions?

Studying the Problem:

1. What influences would you infer that latitude alone would have on this region? Study a physical map and note the lay of the land and the elevations and tell how this would influence temperature.
2. Study the map of the winds and determine the belt or belts in which this region lies. What inference may be drawn as to rainfall?
3. How much rainfall does it have and how is it distributed through the year? (See table on p. 112.)
4. Considering the temperature and elevation, what about the amount of evaporation? What do you conclude with reference to the quantity of water available for plant growth in this region?
5. Explain how cacti are related to such an environment.
6. This region has what is called the Mexican type of climate. It is a part of the inter-tropical province. Color it in red on the world map. Find five other regions of the world that are similar, name them, and put them on the map in red also. (See Dryer.)

References:

Salisbury-Barrows-Tower, Index; Dryer, pp. 329, 335, 481, 489, 490, 493, 498; Dodge, *Advanced Geography*, p. 194; Mill, pp. 777–779; Herbertson, *Senior Geography*, p. 321; Diercke, *Schul-Atlas;* Bartholomew, *Atlas of Meteorology;* Milham, *Meteorology*

Conclusions:

1. Belts of winds and calms in which the Mexican type lies
2. Relation of elevation to rainfall and temperature
3. Relation of latitude to temperature and evaporation
4. Nature and amount of summer and winter rainfall

5. Types of vegetation thriving in this type of climate, with causes
6. Other places in the world having like climate
7. Outstanding characteristics of the Mexican type of climate

Related Problems:

1. How is the climate of the Mexican plateau related to transportation?
2. Why is the Indian in Mexico a more important factor in public affairs than he is in the United States?
3. Why are most of the people living in the Mexican type of climate not as progressive as peoples of temperate regions?
4. Why is the Dekhan more densely populated than the highlands of central Brazil?
5. How do you account for the rainfall distribution in the central African area which corresponds to the Mexican type?

37. ARIZONAN TYPE, OR ARID AND DESERT CLIMATES

Purpose: Studying the causes and effects of the dry region in southwestern United States

Problem: Why can crops be grown successfully in southwestern United States only when under irrigation?

Studying the Problem:

1. About what is the annual rainfall in this region, and how is it distributed through the year? Likewise what is the temperature distribution? (See climatic charts, and Bartholomew, *Economic Atlas.*)
2. From a map of the wind belts find out in which one this region is located at different parts of the year. From what direction do the moisture-bearing winds

come? Why such a low rainfall? (See *Soil Survey, 1910, Yuma Area.*)

3. About how much rainfall is required to grow crops? Upon what does the amount of rain needed depend? What supplementary means is used in such regions in order that crops may be grown?
4. This is called the Arizonan or arid type and belongs to the subtropical climates. Color it in green on your map. Find four others like it and put them on the map in green also. (See Dryer, pp. 224–225.)

References:

Milham, *Meteorology;* Dryer, pp. 328, 391–400, 409; Salisbury-Barrows-Tower, pp. 200–202; Tarr and McMurry, Arizona Supplement, pp. 13–15; *Soil Survey of the Yuma and Solomonville Area, Arizona*

Conclusions:

1. Influence of local elevation and neighboring mountains on rainfall
2. Distribution and amount of rainfall
3. Cause of high percentage of sunshine
4. Planetary belts of winds and calms
5. Factors upon which an adequate supply of precipitation depends
6. Source and application of irrigation water
7. Principal crops of the region

Related Problems:

1. Why do such regions support so small a population?
2. Who were the aboriginal inhabitants of this region, and how did they make a living?
3. Why are west coasts in the region of the trade winds and tropical calm belts usually very dry?
4. Account for any wet regions of the world that you may find in the latitude of the Arizonan type of climate.

38. CALIFORNIAN TYPE, OR WEST-COAST TRANSITIONAL CLIMATES

Purpose: To investigate the causes of the equable climate of California and the seasonal distribution of rainfall

Problem: Why do so many people go to California to spend the winter?

Studying the Problem:

1. In what belts of winds and calms does this region lie at different times of the year? (See *Journal of Geography*, XII, 205.) What is true of the total and seasonal distribution of rainfall?
   Find the facts concerning the temperature and sunshine factors.
2. How do you account for the distribution of rainfall, both areal and seasonal? At least a half-dozen factors should be considered.
3. Note the influence such a climate has on vegetation and life in general.
4. This climate, the Californian type, is found in three other places in the world, one in the Northern and two in the Southern Hemisphere. Find these and put them on the climatic map in green.

References:

Salisbury-Barrows-Tower, pp. 185–189; Dryer, pp. 412–418; *Journal of Geography*, XII, 205; Brigham and McFarlane, *Essentials of Geography; Soil Survey of Woodland and San Bernardino Areas, California*

Conclusions:

1. Belts of winds and calms at different times of the year
2. Distribution of rainfall, with causes
3. Why fine for semitropical fruits
4. Influence of sea on climate
5. Relation of climate of western coast and ocean currents
6. How mountains are involved
7. Why fine for tourists and winter residence

Related Problems:

1. Why is California a good region for wheat, but poor for corn?
2. Why are there marked land and sea breezes in California in summer, but not in winter?
3. Why is southern California dryer than the northern part?
4. What climatic factor was favorable for the development of Greek and Roman civilization?
5. Why are there no climates corresponding to the California type found on eastern coasts?

39. FLORIDAN TYPE, OR SUBTROPICAL EAST-COAST CLIMATES IN THE NORTHERN HEMISPHERE

Purpose: Learning the characteristics of the climate of the southeastern part of the United States and the location of similar climates in the world

Problem: How do you account for the warm equable climate and the heavy evenly distributed rainfall of Florida?

Studying the Problem:

1. Verify the assumptions in the problem. Apply all the factors you have studied about that have to do with temperature and rainfall and see if you can find the causes.
2. From what direction do the winds come that bear moisture to the southeastern coastal plains of the United States? Why is the rain evenly distributed?
3. What types and varieties of vegetation thrive under such conditions?
4. This type and its correlative in China are called the Floridan. Enter these in green on your outline map.

References:

Salisbury-Barrows-Tower, pp. 188–190; Dryer, pp. 328, 356, 473; *Journal of Geography*, XII, 106; Milham,

Meteorology; Climatic Charts of U. S.; Bartholomew, ***Atlas of Meteorology; Wall Atlas of North America; Soil Survey, Jacksonville Area, Florida***

Conclusions:

1. Distribution of rainfall and temperature in Florida
2. Factors involved in producing the Floridan climate
3. Kinds and types of vegetation going with this type of climate
4. Influence of such climate on man's activities

Related Problems:

1. Contrast the climate of Florida with that of Arizona and give causes for differences.
2. Why does the climate of Florida differ from that of areas in corresponding latitudes on west coasts?
3. Why are Florida and China subject to the destructive subtropical cyclone? (See Milham, *Meteorology.*)
4. To what extent is the Floridan climate a result of monsoon effects? Study wind and pressure maps.

40. LA PLATA TYPE, OR SUBTROPICAL EAST-COAST CLIMATES IN THE SOUTHERN HEMISPHERE

Purpose: Determining the outstanding characteristics of the climate of the La Plata region

Problem: What causes the wide difference in the occupations of the people in the Floridan and the La Plata regions?

Studying the Problem:

1. Study the latitude of each type. How do they compare in altitude, their relation to the sea, and surrounding topography? What of the possibility of rainfall being brought to this region in large quantities by the same means as in Florida? As one goes equatorward from this region, will he encounter land or water? Compare with Florida in this respect.

2. By what kind of storms will the rainfall of this region be brought?
3. Be able to summarize the seasonal rainfall and distribution of temperature for this region.
4. The La Plata type of climate, a part of the subtropical region, and its two correlatives should be put on the map in green.

References:

Bowman, pp. 8, 42, 202–205; Salisbury-Barrows-Tower, p. 188; Mill, p. 849; Dryer, pp. 500–502; Milham, *Meteorology;* Oxford University, *Wall Atlas of South America;* Bartholomew, *Atlas of Meteorology*

Conclusions:

1. How the distribution of temperature and rainfall of this region differs from the Floridan
2. How adjacent areas toward the equator influence the climate
3. Wind belt in which this type lies
4. Relation to monsoons
5. Natural vegetation and economic conditions

Related Problems:

1. Why is the La Plata region a grassland rather than forest region?
2. What factors make this a great potential grain region?
3. What are the outstanding features of the corresponding South African region?
4. Why are some of the regions of this type savannas and others steppes?

41. OREGON TYPE, OR TEMPERATE WEST-COAST CLIMATES IN MIDDLE LATITUDES

Purpose: Studying the geographic factors that condition the climate of Washington and Oregon

Problem: What important contrasts can you find in the temperature and amount and distribution of rainfall between San Francisco and Portland, and how do you account for these differences?

Studying the Problem:

1. Find out the belt of winds in which each is located. What is true of the relation of areas of high and low pressure to the Oregon region in summer and winter, and how does this affect the direction and velocity of the wind at different seasons?
2. What of the influence of altitude and latitude? Why more rainfall in winter than in summer?
3. What will be the nature of the storms that bring rainfall, and will a forecast of them be an easy matter? Why? Study the average storm tracks from Bartholomew, *Atlas of Meteorology*, Plate XXIX, and infer any relations to winter rainfall.
4. The Oregon type of climate, a part of the warm temperate area of the world, has two correlatives. Find them and put them on your climatic map of the world in purple.

References:

Dryer, pp. 328, 412, 425, 593; Salisbury-Barrows-Tower, p. 191; *Soil Survey, 1910, Puget Sound Basin, Washington; Journal of Geography*, XI, 102; Tarr and McMurry, Washington Supplement; Bartholomew, *Atlas of Meteorology*, Plate XXIX

Conclusions:

1. Summer and winter winds and air pressure
2. Relation of areas of high and low pressure to this region in summer and winter
3. Influence of mountain and sea
4. Seasonal distribution of rainfall and temperature
5. Possibility of weather forecasting for this region

Related Problems:

1. What factors make the Oregon region important for forests, wheat, and fruits?
2. Account for the distribution of rainfall for northern France and southern Britain.
3. What are the conditions that make the climate of New Zealand like that of Oregon?
4. Why doesn't the eastern coast of the United States in the vicinity of Maine have a climate like that of Oregon and Washington?
5. Why are Wyoming and Montana colder and dryer in winter than Oregon?
6. What climatic advantages has western Europe enjoyed that might be accredited with a large part of her progressiveness?

42. MISSISSIPPIAN TYPE, OR LOW CONTINENTAL INTERIOR AND EAST-COAST CLIMATES IN MIDDLE LATITUDES

Purpose: To learn the characteristics of the climate of east-central United States and the reasons therefor

Problem: What climatic factors favor the production of corn on such a large scale in east-central United States?

Studying the Problem:

1. What do you find to be true as to the seasonal distribution of temperature at Topeka as shown in the table of climatic factors (page 112)? Why so different from that in California?
2. Study maps of seasonal distribution of pressure and see if you can determine from them the general drift of the winds in summer and winter, whether toward the margin or interior of the continent. What type of storms brings precipitation to the Mississippi basin and the southeastern part of the United States?

3. What is the annual and seasonal distribution of rainfall for Topeka, Columbus, and New York City? (See Soil Survey areas.)
4. What is true concerning the amount and seasonal distribution of sunshine in different parts of this region and why so high during the season of greatest precipitation?
5. The Mississippian type of climate, a part of the intemperate area of the world, has two others like it. Locate them and color them in purple on the map.

References:

Salisbury-Barrows-Tower, pp. 195–205; Dryer, pp. 328, 356, 451, 473; Oxford University, *Wall Atlas Map of North America; Climatic Charts of U. S.; Soil Surveys of Shawnee Area, Kansas, Livingston Area, New York, Columbus Area, Ohio;* Bartholomew, *Atlas of Meteorology;* Milham, *Meteorology*

Conclusions:

1. Why this region has extremes of temperature, both seasonal and often daily
2. Why a greater amount of rainfall in summer than in winter
3. Why amount of rainfall decreases westward
4. Reason for high percentage of sunshine in summer
5. Factors involved in making this a great corn region

Related Problems:

1. What are several factors that have made this region one of great economic significance and progress?
2. In what ways do eastern Europe and northern China have climates corresponding to the Mississippian?
3. Why have Russia and China not had the remarkable development that has obtained in central and eastern United States?
4. What are the factors that mark the Russian people as a possible important factor in future world progress?

43. AMERICAN INTERIOR TYPE, OR HIGH CONTINENTAL INTERIOR CLIMATES IN MIDDLE LATITUDES

Purpose: Investigating the climatic characteristics in the northern plateau region of the United States

Problem: All of the territory from central Nebraska, Kansas, and the Dakotas to the Sierra Nevada and Cascade Mountains was once called the "Great American Desert." What reasons can you find for such a name and how do you account for this expression's going out of use?

Studying the Problem:

1. Study climatic table, soil surveys, and maps and determine the distribution of temperature and the amount and seasonal distribution of rainfall in this region. What is the nature of the vegetation supported by such climatic conditions?
2. What animals can be grown successfully in such a region?
3. Account for the peculiar characteristics of temperature and rainfall. Note elevation, latitude, adjacent highlands, wind belt, distance to the sea, etc. What factors have helped to make this region more useful to mankind?
4. There are two other regions in the world, parts of the intemperate area of the world, similar in climate to the American interior. Put them on your map in purple.

References:

Dryer, pp. 328, 391, 398, 399; Salisbury-Barrows-Tower, pp. 191, 203; Mill, pp. 760, 767; Milham, *Meteorology;* Bartholomew, *Atlas of Meteorology; Climatic Charts of U. S.; Soil Survey of Fallon Area Nevada,* and *Minidoka Area, Idaho*

Conclusions:

1. Amount and distribution of rainfall in this area
2. Type of natural vegetation in this region
3. Why irrigation and dry farming are practiced
4. Why the cattle and sheep industries are important
5. Reasons for the small amount of rainfall
6. Why not a good region for swine
7. Why no longer the "Great American Desert"

Related Problems:

1. What is the outlook for the future of this large American interior?
2. How are the people of this region related to and dependent on the more populous regions of the United States?
3. What peculiar characteristics of folks are developed and fostered by nomadic life? By mining communities? By irrigated regions?
4. Mention and explain several ways in which unfavorable geographic conditions have been ameliorated in this region.
5. Why may central Asia be classed with the American interior in climatic respects?

44. ALASKAN TYPE, OR WEST-COAST CLIMATES IN HIGH LATITUDES

Purpose: Studying the factors upon which the climate of southern Alaska depends

Problem: How do you account for the heavy rainfall and mild equable winter climate of southern Alaska?

Studying the Problem:

1. See if you can verify the premises in the problem. In what belt of winds is this region? What type of storms will bring most of the rainfall?

2. Study the average arrangement of the high-pressure and low-pressure areas for winter and summer and see how this would influence direction and rate of air movement.
3. Determine the influence of latitude, adjacent highlands, and waters.
4. Evaluate the influence of the Japan current, the southwest winter winds, and heat freed by condensation.
5. There are two other regions, parts of the cold temperate areas of the world, like this one. Find where they are, and locate and color them in yellow on your map.

References:

Dryer, pp. 328, 508, 511; Salisbury-Barrows-Tower, pp. 22, 120, 138; Mill, p. 681; Bartholomew, *Atlas of Meteorology;* Milham, *Meteorology; Journal of Geography*, XI, 23

Conclusions:

1. Belt of winds in which this region is located
2. Direction of summer and winter winds, with reasons
3. Time of greatest rainfall, with reasons
4. Influence of the Japan current, and liberation of latent heat
5. Why a more equable climate than in the Mississippian region
6. Industrial and economic responses to this type of climate

Related Problems:

1. Why is the winter climate of Norway and Scotland no more severe than that of Washington, D. C.?
2. Why was the purchase of Alaska by the United States a good business deal?
3. Compare the prospect of Alaska for the future with that of Norway and southern Chili.
4. Why does the eastern coast of North America in the latitude of Alaska not have as good a climate as the western coast?

5. Why is the seasonal range of temperature at Sitka not much greater than at many places within the tropics? Verify.

45. CANADIAN TYPE, OR CONTINENTAL AND EAST-COAST CLIMATES IN HIGH LATITUDES

Purpose: Learning the characteristics and causes of the climate of Canada and its correlatives

Problem: Why is it possible to grow such fine crops of small grain and potatoes so far north in Canada?

Studying the Problem:

1. Find out concerning the seasonal and daily range of temperature. Explain the warm summers so far north.
2. What are the amount and seasonal distribution of rainfall, and what are the causal factors?
3. Why does the eastern coast get less rainfall than the western coast? Why is Canada not a good corn country? (See Problem 42.)
4. Show how Siberia has a climate like that of Canada and put the two on your map in yellow. (Why yellow?)

References:

Mill, p. 681; Dryer, pp. 326, 508, 511; Salisbury-Barrows-Tower, pp. 22, 120, 138; Bartholomew, *Atlas of Meteorology;* Milham, *Meteorology*

Conclusions:

1. Maximum range of daily and seasonal temperature
2. Amount and seasonal distribution of rainfall
3. Nature and cause of chinook winds
4. Reason for so much summer sunshine
5. Effect of long summer days on crops
6. Why a great timber and fur country

Related Problems:

1. What are the prospects for Canada's becoming much more important, agriculturally, than it is now?

2. Why are railroads being built to the southern shore of the Hudson Bay?
3. Why is the Mackenzie River not important commercially?
4. What makes the Siberian region like Canada?
5. Would railroads north to the Arctic Ocean be practical in Siberia?

46. ARCTIC TYPE, OR POLAR CLIMATES

Purpose: To evaluate the climatic factors connected with the cold regions of the earth

Problem: Why do explorers in the polar regions experience so many hardships and dangers in their travels?

Studying the Problem:

1. Study tables and maps of temperatures in the far north and state the principal characteristics noted. What is the nature of most of the precipitation?
2. What is true concerning periods of sunshine in the arctic regions and of their effect on temperature?
3. What can you find as to the possibilities of vegetation and animal life and their availability for man's use?
4. Outline on the map, but do not color, the regions having the Arctic type of climate.

References:

Salisbury-Barrows-Tower, pp. 214–224; Dryer, pp. 328, 511; stories of Arctic travel and discovery; Mill, pp. 1025–1046

Conclusions:

1. Seasonal minimum and distribution of temperature
2. Cause of long Arctic days and nights
3. Nature of the precipitation
4. Possibilities of animal and plant production
5. Why men have had great difficulty in reaching the North Pole

Related Problems:

1. Why do not the unsanitary habits of the Eskimo have the same serious results that similar habits would have in our own country?
2. How is the reindeer of great value to the inhabitants of the Arctic regions?
3. Why should the inhabitant of the cold desert be a nomad?
4. What are the prospects for reindeer meat and products taking any large place in the commerce of the world?
5. Why are the cold-desert dwellers less civilized than those of the mid-world deserts?
6. In what month should one traveling to the Arctic region make his dash for the pole? Why? (See account of Peary's trip to the pole.)

47. GREENLAND TYPE, OR CLIMATE OF CONTINENTAL ICE SHEETS

Purpose: Studying the climate of regions covered with continental glaciers

Problem: Why is Greenland inhabited only on the southern margin and not in the interior?

Studying the Problem:

1. What can you find concerning the temperature and precipitation in this region?
2. What parts of Greenland are not covered with ice? What are the possibilities as to the growing of crops of any kind?
3. What is the economic basis of human habitation in Greenland? Where are the animals of Greenland found and what are they?

4. Color Greenland and Antarctica in orange, and then you will have your map of climatic types complete.

References:

Mill, pp. 1040–1043; Dryer, pp. 342, 512–515; Salisbury-Barrows-Tower, pp. 219–224, 385, 386; stories of Arctic and Antarctic exploration; Amundsen, ***Expedition to the South Pole***

Conclusions:

1. As to seasonal range of temperature
2. Amount and distribution of precipitation
3. Parts not glaciated
4. Depth of ice on Greenland
5. Why people can live in Greenland
6. Possibilities of growing crops
7. Extent of Greenland glacier

Related Problems:

1. Give an account of Peary's discovery of the North Pole.
2. Who was the first to find his way to the South Pole and when? Give an account of the trip.
3. What is the nature of the topography of the Antarctic continent?
4. Can the exploration of the polar regions serve any useful purpose?

VIII. DISTRIBUTION OF VEGETATION

PROJECT

This project develops the idea that physical environment is the determining element in the life and distribution of natural vegetation and constitutes the largest factor in the localization of domesticated plants.

48. CONDITIONS OF PLANT LIFE

Purpose: To study the factors upon which plant life depends

Problem: What are the conditions which control the growth and development of plant life?

Studying the Problem:

1. Where and how do plants get their food?
2. How necessary is air to the welfare of plants?
3. What would happen to plants if moisture were withheld from them? In how many ways is moisture useful to plants?
4. Name some of the effects of favorable and unfavorable temperature.
5. Why do plants need sunshine?
6. What are some of the other conditions upon which the welfare of domesticated plants depends besides those mentioned above?

References:

Dryer, pp. 226–243; Salisbury, pp. 462–473; Hardy, *Introduction to Plant Geography*, pp. 136–150; textbooks on agriculture; Gregory-Keller-Bishop, p. 120; Mill, pp. 83–88

Conclusions:

1. How and where plants get food
2. Why plants need air and water
3. Effects of favorable and unfavorable temperature
4. Difference between parasitic and other plants
5. How some plants are dependent upon man for their existence

Related Problems:

1. Show how corn could not thrive in Iowa without man's help.
2. What would happen to all our fine fruits if man should neglect just one generation of trees?
3. Name several plants that have adaptations that peculiarly fit them for desert habitation. Explain fully.
4. What constitutes the difference between deciduous and evergreen trees?
5. Why do the oak, ash, and elm have resting or dormant periods during the year? Is this true of the pine and cedar?
6. Show how cockleburs, sunflowers, and ragweeds manage to thrive in spite of an unfavorable season.

49. TYPES OF PLANT LIFE

Purpose: To study concerning the types of plant life that are best adapted to the different climatic regions of the world

Problem: What are some of the adaptations that plants have taken upon themselves in order to fit into the varying conditions of climate and soil as found in different parts of the world?

Studying the Problem:

1. How do plants differ in regard to the amount of moisture

needed for their growth? What adaptations are to be noted in this connection?

2. What are the different types of woodlands and what are the conditions that favor the development of each?
3. What are the conditions that develop different types of grasslands? How are they named and where are they found?
4. What kinds of vegetation are found in different desert regions? Name some of the important species of desert plants.
5. Explain the nature of the vegetation in some of the transition regions.

References:

Dryer, pp. 226–242; Salisbury-Barrows-Tower, Index; Herbertson, *Man and His Work;* Hardy, *Introduction to Plant Geography;* Oxford University, *Vegetation Wall Maps;* Bartholomew, *Economic Atlas*

Conclusions:

1. Types of plants as related to moisture
2. Woodland types of plant life
3. Types of grasslands
4. Types of desert vegetation
5. Vegetation of transition regions
6. Tundra vegetation

Related Problems:

1. Why are large interiors usually steppe or desert regions?
2. In what way is the natural vegetation of southern Europe adapted to the climate of that region?
3. Why is it more necessary for plants, in a country with a severe winter, to produce seeds than it is in warm regions?
4. Why do coniferous forests cover the Canadian and Alaskan regions?
5. How are plant and animal life related?

50. SURVEY OF PLANT DISTRIBUTION

Purpose: To learn the names of the different plant regions of the world and the reasons for their localization

Problem: What are some of the ways in which the world may be divided up in regard to the distribution of plant life?

Studying the Problem:

1. All the land of the world is either forested or not forested. With this the basis of division, how shall we subdivide each of these regions?
2. If the heat belts serve for this division, what shall constitute the minor divisions of each?
3. If the world is divided into plant regions on the basis of amount of precipitation, how then would you insert the minor regions of the plant kingdom?
4. One of the simplest divisions separates all the vegetation of the world into these parts, namely: deserts, grasslands, and forests. These are further subdivided into cold and hot deserts, temperate and tropical grasslands, and temperate and tropical forests.
   What are the characteristics, names, and causes of each of these vegetation zones or regions?

References:

Dryer, pp. 226–242; Ridgley, *Vegetation Zones of the Earth;* Dodge, pp. 65–72; Herbertson, *Man and His Work;* Hardy, *Introduction to Plant Geography;* Bartholomew, *Economic Atlas;* Salisbury-Barrows-Tower, Index; Salisbury, pp. 462–472

Conclusions:

1. Nature and cause of tropical and temperate forests
2. Nature and cause of steppes, prairies, and savannas
3. Meaning of selvas, llanos, campos, pampas, sudan, sahara, and tundra

4. Nature and cause of type of vegetation found in hot and cold deserts
5. Continents containing a zone of each type
6. Why the zones of plant life do not follow parallels of latitude

Related Problems:

1. Why is there such a dense continuous growth of vegetation along the Amazon River?
2. On the basis of the classification given in (4) under "Studying the Problem," get Goode's *School Atlas* or Harshberger's vegetation maps of the world and of North America, and using six colors or shades fill in an outline map showing the vegetation regions. On the margin of the map show the meaning of the color scheme.
3. What vegetation regions would you cross in going in a straight line from the Arctic-Siberian coast, 110 degrees East Longitude, to the equator, 15 degrees East Longitude, and thence to the Cape of Good Hope?
4. Make similar journeys over the land on each of the tropics, and on the 45th and 60th parallels of North Latitude. Name and explain the vegetation zones crossed.

IX. DISTRIBUTION OF ANIMALS

PROJECT

This project is designed to show that climate and vegetation are the factors that condition the distribution of animal life over the earth.

51. CONDITIONS OF ANIMAL LIFE

Purpose: To teach the factors upon which all animal life depends

Problem: What are the primary necessities of life without which animal life would become extinct?

Studying the Problem:

1. Name some of the different kinds of food that animals are able to take into their systems and assimilate. How is the food prepared for assimilation?
2. What part does air play in the welfare of animals? Give ways in which different animals get and utilize air. What is the vital element and for what is it used?
3. How is temperature related to animal welfare? Give ways in which different animals are adapted to temperature changes and conditions.
4. What does water have to do with the welfare of animal life? Give three or four important considerations.
5. See what you can find out about animal homes.

References:

Salisbury, pp. 473–485; Dryer, pp. 243–254; Salisbury-Barrows-Tower, Index; Dodge, pp. 72–78; Newbigan, *Animal Geography;* Mill, p. 90; Herbertson, *Man and His Work;* Diercke, *Schul-Atlas*, pp. 15–16

Conclusions:

1. Relation of food to animal welfare

2. How food is prepared and assimilated
3. Relation of air to animal life and how used in the animal's body
4. How temperature is related to animal life
5. Relation of water to animal economy and its particular value
6. Relation of water to regulation of animal temperature

Related Problems:

1. How is the cow, the horse, and the chicken each prepared to masticate the food taken into the body?
2. Contrast the teeth of a rabbit with those of a cat and explain the difference found.
3. Account for the difference in the structure of the mouth of a duck and that of a chicken.
4. Judging from the structure of a hog's nose, how is he supposed to get his living?

52. TYPES OF ANIMAL LIFE

Purpose: To study the various adaptations of animals for the particular kind of life each lives

Problem: How do the ways in which an animal gets his food and protects himself from his enemies have a great deal to do with the structure and adaptations of his body?

Studying the Problem:

1. Why and in what particulars do land and water animals differ in structure?
2. Animals may be classed as carnivorous, herbivorous, and omnivorous? What does each of these terms mean?
3. Why do fish differ so much in structure among themselves?
4. Give some distinguishing characteristics of carnivorous animals. Name ten carnivorous animals.

5. What are some of the outstanding features in the structure of herbivorous animals in connection with getting food and securing protection from enemies?
6. Give a general classification of animal life, beginning with the lowest forms and concluding with the highest.

References:

Herbertson, ***Man and His Work;*** Dryer, pp. 243–254; Salisbury, pp. 473–485; Dodge, pp. 72–78; Mill, p. 90; Newbigan, ***Animal Geography;*** Salisbury-Barrows-Tower, Index

Conclusions:

1. Comparative structure of land and sea animals
2. How animals are classified in relation to food
3. Why animals of the same class differ so much in structure
4. Distinguishing characteristics of carnivora and herbivora as to structure and methods of getting food
5. Classification of animal life

Related Problems:

1. How does the kind of food an animal eats influence his temperament?
2. Which is apt to live more in group life, the vegetarian or the flesh-eating animals? Why?
3. Why do quadrupeds not follow seasonal migrations as birds do?
4. Why are the movements of the flyers much more rapid than the movements of the swimmers?
5. Select from pictures good illustrations of swimmers, walkers, runners, climbers, flyers, and jumpers.
6. Show how all animal life must be dependent on plant life.

53. SURVEY OF ANIMAL DISTRIBUTION

Purpose: To learn the reasons for the way animal life is distributed over the earth

Problem: What types of animal life are found in connection with the different zones of temperature and climatic regions of the earth?

Studying the Problem:

1. What are the types of animals that usually inhabit grasslands?
2. Name some of the animals that live in the water part of the time and out of it part of the time.
3. Why is there a striking resemblance among the different classes of animals in the North Temperate Zone or northern realm?
4. What are the chief distinguishing features of the Indo-African realm of animal life?
5. In what respects are the animals of South America in a class by themselves? Reasons.
6. What marked characteristics are possessed by the animals of the Australian region?

References:

Dryer, pp. 243–254; Salisbury-Barrows-Tower, Index; Salisbury, pp. 473–485; Dodge, pp. 72–78; Unstead and Taylor, *General and Regional Geography*, pp. 161–164; Newbigan, *Animal Geography;* Mill, *International Geography*

Conclusions:

1. Names and characteristics of typical grassland animals
2. Land and water types
3. Characteristics of animals of northern realm
4. General characteristics of animals of Indo-African realm
5. How the South American realm is distinguished from others
6. Peculiar characteristics of Australian animals

Related Problems:

1. Find the so-called "Wallace's Line" and account for its location.

2. Account for the difference in structure between the giraffe and the deer.
3. In what ways is the hippopotamus peculiarly adapted to his environment?
4. Name several animals that are fitted with protective color adaptations.
5. How are the stripes of the tiger a protection to him? (Give two ways.)

X. DISTRIBUTION OF MAN

PROJECT

This project aims to introduce the factors that determine the distribution of the human family over the earth.

54. CONDITIONS OF HUMAN EXISTENCE

Purpose: To study the basic factors of man's fundamental necessities

Problem: What are the common necessities for human existence, and whence do they come?

Studying the Problem:

1. What are some of the foods that satisfy human needs in different parts of the world?
2. Why do men differ in their desires for clothing? What materials are used?
3. What are some of the different types of shelter that are used in different regions of the world? What determines the kinds of materials used?
4. How has man's ability to design and use tools influenced his progress in the world?
5. What methods of transportation has man invented and used for his growth and development in the world?
6. What rôle have luxuries played in man's progress?

References:

Dryer, p. 255; Brigham and McFarlane, Advanced Book; Herbertson, *Man and His Work;* Mill, pp. 96–108; Gregory-Keller-Bishop, *Physical and Commercial Geography;* Semple, *The Influences of Geographic Environment;* Keller and Bishop, *Commercial and Industrial Geography*

Conclusions:

1. Staple human foods in different parts of the world
2. Satisfying needs for clothing
3. Why different kinds of shelter are constructed
4. Rôle of tools in man's progress
5. How transportation promotes division of labor
6. How luxuries become necessities

Related Problems:

1. How is the kind of food to which the Eskimo has access particularly adapted to his needs?
2. Why may we expect the airplane to become a very important factor in our complex life?
3. How has the freedom of the hands of man influenced his mental development?
4. Trace the development of harvesting machinery and show how it has benefited mankind.
5. Show how the bicycle has grown in use from a plaything to a necessity.

55. TYPES OF THE HUMAN FAMILY

Purpose: To investigate the characteristics upon which we may base the division of the human family into types

Problem: What are the distinguishing features that enable us to separate the billion and a half people of the world into races and types?

Studying the Problem:

1. On the basis of color of skin, how is the human family divided? Give illustrations of each division.
2. How may characteristics of hair serve as a criterion for a division?
3. How does the shape of the skull help in another classification?

4. What characteristics of stature may serve as a basis upon which to divide people into types?
5. Upon what additional basis does anthropology divide the peoples of prehistoric times?

References:

Dryer, pp. 255–262; Unstead and Taylor, pp. 165–192; Ripley, *Races of Europe;* Mill, pp. 98–108; Grant, *The Passing of the Great Race;* Bartholomew, *Economic Atlas,* p. 13

Conclusions:

1. Division of humankind on basis of color
2. How hair serves as a basis of division
3. The characters of skull serving as a basis of division
4. How humankind may be divided on the basis of stature
5. Where most of the people in each of the above classifications may be found
6. How prehistoric peoples may be classified

Related Problems:

1. Why do people of the white race dislike to mix with other races?
2. Do other races have the same antipathy toward the white race?
3. What are the prospects of the different races of the world amalgamating into one great world race?
4. Give illustrations of inferior races dominating a superior people.
5. What are the different types of the Caucasian race? What are the distinguishing features?

56. SURVEY OF HUMAN DISTRIBUTION

Purpose: To study some of the factors determining the distribution of humankind

Problem: Why are some parts of the world more densely populated than other parts?

Studying the Problem:

1. Name six factors upon which the density of population depends
2. Study a world map of density of population. What zones of temperature seem most favorable for supporting dense populations? Why?
3. Find some river valleys that are densely populated and some that are not and give reasons.
4. Where are there some highlands that support a comparatively dense population?
5. Why are manufacturing regions usually more densely populated than agricultural regions?
6. What natural resources are conducive to the building-up of centers of dense population?

References:

Salisbury-Barrows-Tower, pp. 392–405; Dryer, pp. 261–262; Bartholomew, *Economic Atlas*, p. 12; Unstead and Taylor, pp. 342–345; Dodge, *Advanced Geography;* Goode, *Wall Atlases*

Conclusions:

1. Factors upon which density of population depends
2. Climatic regions most favorable for a dense population
3. Why broad river valleys are often favorable for supporting large populations
4. Why most highlands are not favorable for supporting large populations
5. Reason for manufacturing regions supporting large populations
6. Relation of natural resources to density of population

Related Problems:

1. Why is the largest area of dense population in North America east of the 100th meridian?
2. Explain the distribution of population in Australia.
3. Account for the dense population along the Nile River.

4. How can the densely populated agricultural areas of India, China, and Japan support themselves?
5. Why is central Africa more densely populated than central South America?
6. Why are seven-tenths of the cities of the United States having in 1910 a population of more than 100,000 situated east of the Missouri River and north of the Ohio?
7. Account for the distribution of population in California. In Argentina.

THE APPENDIX

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SOME NOTES FOR TEACHERS ON THE PROBLEM METHOD OF ATTACK IN GEOGRAPHY

It is now a well-recognized fact that geography can make pupils think if the materials are presented in such a way as to give them an opportunity. This has been known for a long time, but somehow or other writers of texts and syllabi have not discovered how to organize the facts so that they will motivate the pupils for thinking. Now, it is a well-known fact that one thinks only when confronted by a difficulty. And even then a person does not think unless he feels that the difficulty is peculiarly his own and that he must have a solution. This educational axiom furnishes the foundation for the *problem method of attack* in teaching geography.

There are several steps in the problem-solving process which teachers using the method should know and understand. The problem itself should satisfy several rather exacting requirements, among which are the following:

First, it must involve facts and principles that are evidently worth while.

Second, the pupil should be made to feel that the problem is one of his own choosing and not one that has been forced upon him.

Third, it should involve a considerable amount of material organized about a unit of work.

Fourth, it should not be too difficult.

Fifth, it should have a striking appeal so as to shock the pupil into attention.

Much of the work in satisfying the above requirements has been done for the teacher who uses this syllabus, but not all.

No syllabus or outline can always present the problems in such a way that they will meet the second and fifth requirements as stated. It is really the work of the teacher to motivate the pupils, if possible, into a joyful reception of each unit of material that is to be presented. The attitude thus created prepares the pupils to state the problem in their own way or puts them into a frame of mind wherein they are glad to accept the teacher's statement of the problem or the one given in the syllabus. The purpose stated in connection with each of the problems in the syllabus furnishes the aim, and the conclusions called for summarize the ends to be attained. It is left to the teacher to find out whether or not the pupils will choose the problem as stated or will find some other wording of it more appealing to them. The matter of problem assignment is almost a fine art in itself. The teacher must use her utmost ingenuity in making the pupils feel that the problem is their very own. How can she do this? There are many ways. Suppose the topic is "Coastal Features That Result from a Rising and Sinking of the Land." A class exercise on the physical map of North America can be so conducted as to raise the problem. Let the teacher direct the pupils to look for peculiarities in the contour of the continental shelf. One of the interesting features that may be discovered is the deep sub-sea channel leading from the St. Lawrence River out to the edge of the continental shelf. This might lead the pupils to want to know why that deep channel is there. Thus the problem of rising and sinking coasts would arise. Or the pupils in their study of coastal cities might come across the interesting fact that there were more important coastal cities on the north than on the south Atlantic seaboard of the United States. This again would raise the question why, and again we should be into the problem of rising and sinking coasts. It will be noted that problem eleven of the syllabus is the one about coast lines and harbors. Now, if the teacher finds that the pupils' interest happens to center more about Related Problem No. 1 or 5 than about the main problem as stated, no violence will be done the syllabus, or pedagogy, or common sense, if the same principles and conclusions are evolved by following the pupils' own choice. In

other words, problems need not be cast in an iron mold. There should be a large amount of flexibility in the choice of problems, and this syllabus is only a guide which the resourceful teacher may depart from a great deal, but which the routine teacher will follow quite closely. In either case the children will be made to think. In the first case the work will be done joyfully, in the second more laboriously.

After the problem has been stated, the next step demanding attention is the solution. The solution involves several steps each of which will be given brief notice.

First, the pupils should get a general idea of the order of procedure. The part of the outline entitled "Studying the Problem" is given as a guide for this work. These questions should be read through carefully and thoughtfully. This reading should be followed by a tentative outline of points to be worked out.

Second, the data called for in the tentative outline should be gathered from facts and principles previously learned, from the reading references given, and from experimentation and other available sources of information. Notes on this reading should be kept until a sufficient fund of material is gotten together to solve the problem.

Third, the tentative outline should be converted into a completed outline. The conclusions called for in connection with the problem serve as a guide in organizing the material into a completed unit of work.

Fourth, the related problems are very important in that they generally involve some or all of the principles learned in the main problem. They serve the same purpose in geography that the lists of problems serve in arithmetic—namely, drill in the use and application of principles—and at the same time enlarge the pupils' fund of usable geographic knowledge. These problems will also be found very useful for frequent oral or written reviews, serving to show both the pupils and the teacher whether or not important principles have really been digested and assimilated. It is suggested that in purely academic courses the three introductory problems may be omitted, but in all teachers' training courses in geography these problems are very important.

RAINFALL IN THE CLIMATIC REGIONS OF AMERICA

Region	City	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Amazon	Para	8.0	8.0	10.0	10.0	10.0	8.0	3.0	3.0	1.5	1.0	1.5	3.0	67.0
Caribbean	Vera Cruz	0.5	1.0	1.5	2.0	6.0	18.0	15.0	10.0	16.0	10.0	5.0	3.0	88.0
Mexican	Durango	0.5	0.5	1.0	1.0	2.0	3.0	3.0	4.0	2.5	1.5	1.0	0.5	20.0
Arizonan	Yuma	0.4	0.5	0.3	0.1	0.0	0.1	0.2	0.2	0.3	0.3	0.4	0.5	3.3
Californian	San Francisco	4.6	3.5	3.3	1.8	0.7	0.3	0.0	0.0	0.4	1.3	2.8	3.5	22.2
La Plata	Buenos Aires	3.0	4.0	6.0	4.0	3.0	2.5	2.5	1.5	3.0	5.0	4.0	4.5	41.0
Floridan	Jacksonville	3.0	3.3	3.4	2.8	4.0	5.6	6.3	6.2	8.2	5.2	2.6	3.0	53.6
Oregon	Portland	8.0	7.0	6.0	4.0	3.0	2.5	0.5	0.5	1.5	4.0	7.0	10.0	53.5
Mississippian	Topeka	1.0	1.7	2.2	2.7	5.3	4.7	4.8	4.6	3.3	2.2	1.2	1.0	34.7
Interior	Denver	0.4	0.6	0.8	2.0	2.6	1.5	1.7	1.6	0.8	0.9	0.6	0.7	14.3
Alaskan	Sitka	6.0	10.0	8.0	6.0	4.0	4.0	3.0	4.0	7.0	8.0	12.0	10.0	84.0
Canadian	York Factory	0.5	0.5	0.5	1.0	3.0	3.0	5.0	5.0	1.5	1.0	0.7	0.5	21.0
Arctic		0.3	0.3	0.4	0.4	0.5	1.0	2.0	2.0	1.0	0.5	0.4	0.3	9.1

TEMPERATURE, CLOUDINESS, AND WIND BELTS OF THE CLIMATIC REGIONS OF AMERICA

Place	Temperature in Fahrenheit				Cloudiness in Per Cent	Belt of Winds or Calms
	Max.	Min.	Av. Annual	Av. Range		
Para	95	68	80	5	45	Doldrums
Vera Cruz	95	54	80	10	60	Trade winds
Durango	95	45	77	20	35	Trade winds
Yuma	100	35	67	30	35	Trade winds and horse latitudes
San Francisco	93	35	60	10	45	Trades, horse latitudes, and westerlies
Buenos Aires	100	23	63	30	40	Westerlies
Jacksonville	95	35	67	30	45	Westerlies and trade winds
Portland	90	10	52	30	55	Westerlies
Omaha	100	−32	52	55	45	Westerlies
Denver	105	−20	67	45	35	Westerlies
Sitka	77	−10	43	45	65	Westerlies
York Factory	90	−40	20	75	60	Westerlies
Arctic region	55	−50	10	65	65	Circumpolar
Greenland	58	−59	15	60	45	Circumpolar

REFERENCES NEEDED IN THIS COURSE

BOOKS ON TEACHING GEOGRAPHY

**Archer-Lewis-Chapman, *The Teaching of Geography.* A. & C. Black.

**Dodge and Kirchwey, *The Teaching of Geography.* Rand McNally & Co.

**Holtz, *Principles and Methods of Teaching Geography.* Macmillan.

Lyde, *The Teaching of Geography.* Blackie & Son.

*Sutherland, *The Teaching of Geography.* Scott, Foresman & Co.

BOOKS ON SUBJECT MATTER IN GEOGRAPHY

*Adams, *Map Projection.* George Phillip & Son.

**Arey-Bryant-Clendenin-Morey, *Physiography.* D. C. Heath & Co.

**Bowman, *South America.* Rand McNally & Co.

*Brigham, *From Trail to Railway through the Appalachians.* Ginn & Co.

*Brigham, *Geographic Influences in American History.* Ginn & Co.

Brigham and McFarlane, *Essentials of Geography.* American Book Co.

**Dodge, *Advanced Geography.* Rand McNally & Co.

**Dryer, *High School Geography.* American Book Co.

Grant, *The Passing of a Great Race.* Scribner.

*Gregory-Keller-Bishop, *Physical and Commercial Geography.* Ginn & Co.

*Hardy, *Introduction to Plant Geography.* Oxford University Press.

*Harrington, *About the Weather.* D. Appleton & Co.

*Herbertson, *Man and His Work.* A. & C. Black.

Herbertson, *Senior Geography.* Oxford University Press.

*At least one copy of those references marked with one asterisk should be available for class use.

**Several copies of those references marked with two asterisks should be available for class use.

**Hotchkiss, *Representative Cities of the United States.* Houghton Mifflin Co.

*Johnson, *Mathematical Geography.* American Book Co.

Keller and Bishop, *Commercial and Industrial Geography.* Ginn & Co.

*Milham, *Meteorology.* Macmillan.

**Mill, *The International Geography.* Macmillan.

*Newbigan, *Animal Geography.* Oxford University Press.

**Ridgley, *Vegetation Zones of the Earth.* McKnight & McKnight.

Ripley, *Races of Europe.* D. Appleton & Co.

**Robinson, *Commercial Geography.* Rand McNally & Co.

**Salisbury, *Physiography, Briefer Course.* Henry Holt & Co.

**Salisbury-Barrows-Tower, *Elements of Geography.* Henry Holt & Co.

*Semple, *American History and Its Geographic Conditions.* Houghton Mifflin Co.

*Semple, *The Influences of Geographic Environment.* Henry Holt & Co.

*Smith, *Commerce and Industry.* Henry Holt & Co.

Sutherland and Sanford, *Practical Exercises in Geography.* Silver, Burdette & Co.

*Tarr, *Physical Geography.* Macmillan.

Tarr and McMurry, *New Geography.* Macmillan.

Unstead and Taylor, *General and Regional Geography.* George Phillip & Son.

MAPS AND ATLASES

*Bartholomew, *Atlas of Meteorology.* Rand McNally & Co., agents.

**Bartholomew, *A School Economic Atlas.* Rand McNally & Co., agents.

*Diercke, *Schul-Atlas.* Rand McNally & Co., agents.

*Goode, *School Atlas.* Rand McNally & Co.

*Harshberger, *Vegetation Map of North America.* Rand McNally & Co.

Longmans, *New School Atlas.* Longmans, Green, & Co.

Oxford University, ***Wall Maps.***

Goode, ***Wall Maps of the Continents.*** Rand McNally & Co.

*Van Cleefe, ***Precipitation Map of the United States.*** Rand McNally & Co.

GOVERNMENT PUBLICATIONS

Smithsonian Report, 1912, Amundsen, Expedition to the South Pole.

**United States Bureau of Soils, Washington, D. C. (free to schools):

Survey of Yuma and Solomonville Areas, Arizona
Survey of Woodland and San Bernardino Areas, California
Survey of Jacksonville Area, Florida
Survey of Puget Sound Basin, Washington
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Survey of Columbus Area, Ohio
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**United States Weather Bureau, Washington, D. C. (free):

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Water Supply Papers and Monographs on Home Area

*United States Bureau of Education, Washington, D. C.
Geographic News Bulletin (free weekly)

MAGAZINES

**Journal of Geography,* A. J. Nystrom & Co., Chicago.

**Geographical Review,* American Geographical Society, New York City

**National Geographic Magazine,* National Geographic Society, Washington, D. C.

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